THE

DENTAL COSMOS:

A

MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

EDITED BY

JAMES W. WHITE, M.D., D.D.S.

Observe, Compare, Reflect, Record.

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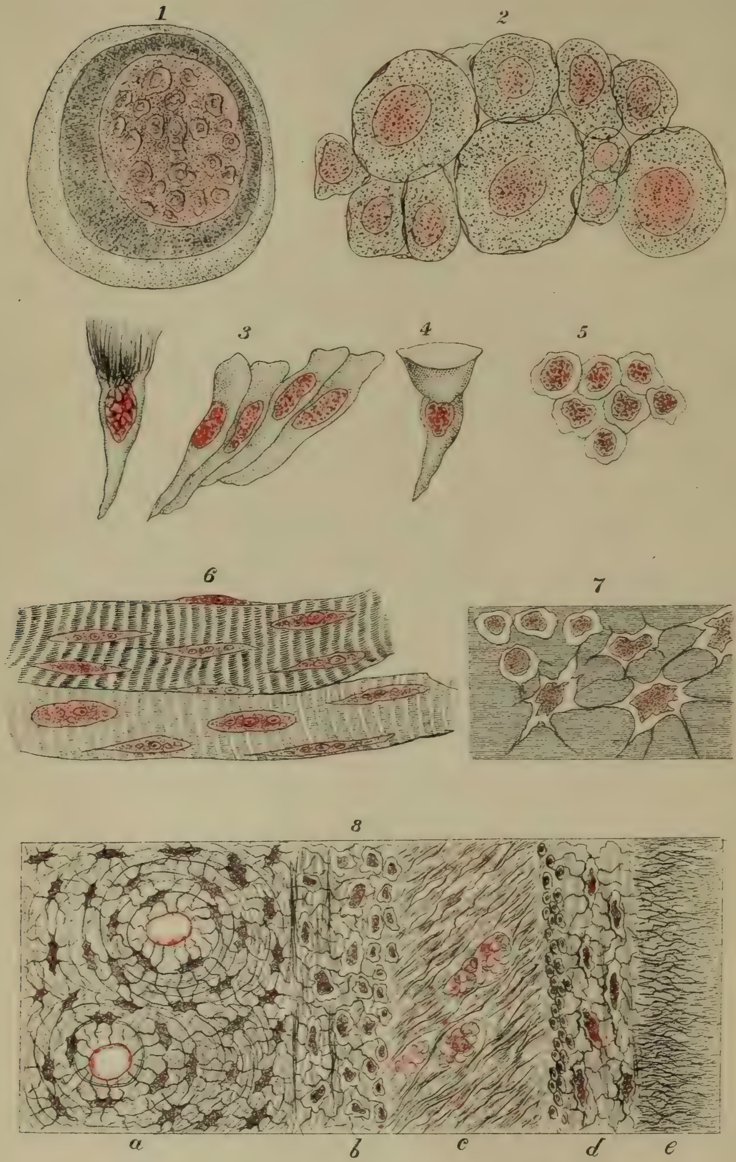

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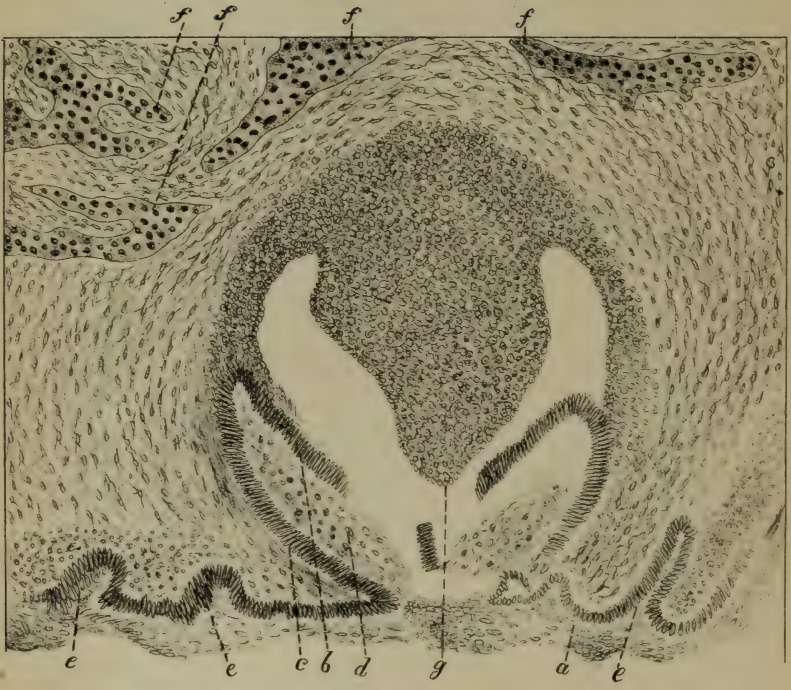

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THE

DENTAL COSMOS.

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ORIGINAL COMMUNICATIONS.

THE BEGINNING OF PHYSICAL LIFE.

BY J. L. WILLIAMS, NORTH VASSALBORO, ME.

(Read before the Maine Dental Society, July 20, 1881.*)

THE present age is pre-eminently one of investigation. In every department of natural science patient workers are pushing their inquiries close up to that mysterious border-line which divides the objective from the subjective condition of life. The ultimate facts of science seem to leave us upon a height where one step more would reveal to us the great mystery of life which lies just beyond. The attitude of the scientific world to-day is one of eager expectancy.

What next? is the question that every earnest investigator is asking of his neighbor. We have traced the material phenomena of life up through the senses until we are confronted by a veil which shuts out our view, beyond which sensation is converted into consciousness. In an opposite direction we have traced life back to its simplest forms, but we still find an impassable gulf between the lowest forms of organic life and the mineral world below it.

What is life? What is the nature of that mysterious force which, acting upon two minute masses of protoplasm between which the highest magnifying powers can detect no difference, develops one into a jelly-fish and the other into a man? What is the relation between the last pulsation of the material brain, acted upon by waves of light or sound, and the first awakening consciousness of mental perception? These are mysteries beyond which we may not at present penetrate, but it behooves us that we draw no erroneous conclusions from the truth which we already have.

* This paper, although rewritten and somewhat enlarged, still retains the principal features of the original as read at the date above mentioned.

There is a large and popular class of scientific investigators who teach that there is no precise line of demarkation between physiological and psychological facts or between the objective and subjective condition of life. With them the simplest function of an amœba and the loftiest thought of a Newton are alike the result of the molecular relations of matter. To my mind the argument that because consciousness or mental action never reveals itself except in the presence of cerebral matter, therefore it is a property of it, is very shallow philosophy. As well might it be said that the invisible rays which lie beyond the violet in the spectrum are the property of the prism which alone reveals their existence; or, that the mechanical energy of steam is a property of the engine through which it accomplishes its work. This materialistic sort of reasoning, like one lost in a forest, always proceeds in a circle and at last comes back to the original point of departure. There is one important consideration which should always be kept in view in scientific inquiry. Our knowledge of nature is after all but the result of the interaction between the forces of life without and those within us. Our senses constitute the medium through which this interaction takes place, and had they been differently constructed our knowledge of nature would have been correspondingly different.

Many animals and insects sustain a relation to the external world about them of which we have but little conception. The development of new powers within us or new methods of using our faculties is constantly widening the scope of our mental vision. The wonderful advance which scientific knowledge has made during the past century, particularly that phase of it which has relation to the origin and development of vegetable and animal life, may be very largely attributed to the discoveries made by use of the microscope. Now, the deeper we penetrate into the mysterious workings of life by means of this instrument the more convincing becomes the evidence that there is a fixed and definite point where the *immaterial* forces of existence meet matter to form some particular expression of life.

The discovery of a single new fact often shows us that much of that is error which we had up to this point regarded as fixed truth. This correcting or overcoming of error has proved to be one of the greatest incident labors in the onward march of scientific investigation. In histology, as in every other department of study, very much has been accepted upon authoritative statement. The tendency has been, with the great mass of mankind in all ages of the world, to allow a few self-appointed leaders to do the most of their thinking and investigating. They have accepted information *second-hand* and have too frequently been content with a cheap or inferior article.

First and highest among those who have endeavored to clear away the mists of confusion and clouds of error with which many of the older writers have surrounded the study of histology, stands Dr. Lionel S. Beale, a patient, conscientious worker, a man who accepts the authoritative statement of no one and describes only that which he actually sees and observes. As a fitting prelude to what I may have to offer in this paper on the development and maintenance of growth of animal tissues, I wish to say a few words concerning Dr. Beale's investigations. He begins with the proposition that the substance of which all animal bodies are composed may be broadly divided into matter in two conditions, namely: *bioplasm*, or living, vital, germinal matter, and *formed material*, or non-germinal matter, the latter the product of and always surrounding the former. Matter in these two conditions has been described as cell, cell-wall, cell-contents, cell-membrane, primordial utricle, endoplast, periplast, protoplasm, nucleus, nucleolus, nucleolulus, etc., etc.; all of which is very confusing to one beginning the study of histology, especially considering that different authors use these words in different senses and apply the same word to essentially different substances. Protoplasm, for instance, has been used to signify either *dead* or *living* matter, between which there is a vast difference. A correct and definite nomenclature is of primary importance in the study of any science. The term bioplasm is always used to signify a particular condition of matter, designated by Beale as vital or germinal.

It has been found that when any tissue, striated muscle, nerve-fiber, cartilage, or any part of the body is exposed for a short time to a properly-prepared carmine staining-fluid, a part on examination will be found brightly stained while a portion remains quite colorless. Beale says. "The material stained by carmine must be regarded as matter in a state of change. It is as different from pabulum as it is from tissue. Bioplasm is not tissue, for it lives and grows, but it may at length undergo conversion into tissue. It is *living matter*, and in this state differs absolutely from matter in every other known condition. Now, by the word living I desire to imply that in this matter so-called phenomena of a peculiar nature occur, which phenomena have not been explained.

"1st. The power of altering and appropriating certain soluble matters, and communicating to these properties or powers of the same nature as those which the already existing living matter itself possesses.

"2nd. The passage of one part of a living mass to another part so that one portion may advance itself in front of another, or encircle or blend with it.

"3rd. The power of causing the atoms of matter to assume defi-

nite relations to one another, so that definite compounds, perhaps not to be produced in any other way, and often exhibiting definite structure, may result, when the matter shall have passed from the vital condition.

"4th. The power of infinite increase."

These are the characteristic properties of that part of every tissue of the body which Beale calls bioplasm or living matter. It is a state or condition of matter peculiar to itself and one which modern materialism utterly ignores because it has no explanation to offer concerning it. "Every particle of the bioplasm of living matter came from a pre-existing particle, and every piece of tissue or formed material derived from a living being was once in the condition of bioplasm."

With Beale there is no intercellular substance, or rather with him the term is not an appropriate one. All matter intervening between the masses of bioplasm is *formed material*, and is the result of pabulum, which having passed through the condition of bioplasm, loses the properties of vital, germinal matter, and assumes a definite structure, or, in some instances, is thrown off at once as absolutely dead, waste material. In nutrition, as it occurs in man and the higher animals, "the food introduced into the stomach becomes dissolved and the solution is taken up by the *bioplasm* of the villi, the chyle corpuscles and the colorless blood corpuscles. Changes occur in the masses of bioplasm and the products resulting form the pabulum for the bioplasm which takes part in the formation of the various tissues. The pabulum passes to the center of the bioplasm where it receives the properties of vital, germinal matter. As this accumulates, the older portions are pushed outward until they come in contact with other influences, when they lose their life properties and become formed material. Much misconception prevails in connection with this subject in consequence of the term nutrition having been vaguely applied to the process by which the increase of the body or a limb or an organ is provided for. It is generally supposed that when a tissue grows, certain matters existing in the blood pass from that fluid, undergo change, and are directly added to the tissues. In the nutrition of such a tissue as cartilage, for instance, it has been concluded that the matrix of intercellular substance is deposited directly from the blood, and that the masses of bioplasm or cells take no active part in the formation of the so-called matrix. But cartilage matrix does not exist in a state of solution in the blood, and it is therefore incumbent upon those who hold the doctrine above mentioned to explain by what means the pabulum becomes altered in passing through the walls of the vessels, and how it is changed in its composition, acquiring the properties of cartilaginous texture."

We find this to be in perfect harmony with that great fundamental law of all science and philosophy that *creation proceeds from center to circumference.* According to Beale all changing, transforming power resides in the bioplasm alone, and every kind of formed material or intercellular substance must first pass through this condition before tissue can be produced. It is on the outer part of the formed material that oxygen acts, combining with the unstable compounds to form the secretion of cells. The nucleus and nucleolus result from the tendency of all living matter to form new centers.

Perhaps we are now as well prepared as space and time will admit for a brief consideration of the results of my own investigations in this direction. Whatever merit or lack of merit these investigations may exhibit I leave others to decide. I claim nothing but the merit of actual and original work for what I present; I describe only that which I have seen and can show, and the cuts, so far as my imperfect skill will allow, are truthful representations of nature.

Whichever may have originally been first, the egg or the hen, the beginning of physical life, as we now know of it, is with the egg. While the intention of this paper is not so much to consider the beginning of physical life with the individual as it is to indicate the precise points in individual structures where physical life begins, or where matter actually begins to live, it yet suits our purpose to commence with the ovum of the frog, shown on Plate 1, Fig. 1. I have selected this because it represents very nearly the ideal cell and because it is an excellent illustration of Beale's theory. You will observe that the inner part, the germinal matter or bioplasm, is stained by the carmine fluid, while the outer portion or formed material (in this instance, I suppose it is really pabulum or food-material) remains colorless. The coloring matter does not shade from the center outward in a gradual manner, but the dividing line between the two conditions of matter is strongly marked. Beale says: "There is no gradual transition from the non-living into the living state, but matter passes suddenly from the one into the other." In the ova of all animals this portion of the egg which is stained is called the germinal vesicle, within which may be observed germinal spots or new centers, or, as Dr. Beale calls them, bioplasts. In the ordinary method of staining and mounting microscopic preparations these bioplasts are not shown, or, if at all, very indefinitely. In fact by the old method of preparing microscopic specimens and mounting them in balsam, nearly all of those points which are of the utmost importance are lost. This is particularly true of all delicate embryonic and rapidly growing tissues. Pure bioplasm is,

in itself, perfectly clear, transparent and structureless. The granular appearance which it usually presents is the result of extraneous particles or formed material within the bioplasm.

Leaving the ovum for the present let me call your attention briefly to the remaining figures shown upon Plate 1, in order that you may have a clear, definite idea of the relation which the bioplasm sustains to formed material in some of the tissue-elements. Fig. 2 was drawn from a microscopic slide, magnified about sixty diameters, showing the so-called gland cells with giant nuclei of the little water newt. They are concerned in the secretion of that slimy, mucus-like fluid which covers the body. These cells, both in the bioplasm and formed material, present a granular appearance throughout. Nothing in the appearance of these cells before they are subjected to the staining process would lead the most careful observer to conclude that there was any material difference between the inner and outer portion, but the development of an acid reaction in all vital matter immediately after death gives it an affinity for the alkaline staining fluid which reveals its presence. These cells are surrounded by a delicate reticulum of connective tissue, nerves, and vessels, which throughout show a dotting of bright red spots or bioplasts. The white blood-corpuscle is an element concerning which very much has been written, although but little is really known of its origin, functions, or destiny. I mention it, not to enter the field of discussion, but to correct what I believe to be an error in regard to its identity with the pus-corpuscles. The white blood-corpuscle may be and is undoubtedly often converted into the pus-corpuscle, but it is a mistake to suppose that all pus-corpuscles were once white blood-corpuscles. Life, in its normal condition, is an equilibrium of certain forces and a proper proportion of the constituent elements of which the body is composed. Irritation causes an increased flow of pabulum to the bioplasm in the immediate vicinity of the point of irritation. An augmented or abnormal activity of the bioplasm is the result. If this process increases in intensity the production of formed material or, according to the old idea, the organization of tissue, is prevented and pus or degenerated bioplasm is the result. We have seen that bioplasm is the living, vital part of every tissue-element of the body and wherever there is an increased flow of pabulum to any point beyond the capacity of the bioplasm to organize it into formed material, there pus will be formed. I believe that this one idea, if carefully followed out, will throw more light upon the subject of the disorganization of tissue than all that has ever been written. It may be well to remark in passing that all the phenomena of physical life—nerve-impulse, muscular contractility, assimilation of pabulum and its conversion into

living matter—are foreshadowed in the little microscopic mass of bioplasm, the white blood-corpuscle. Fig. 3 shows a ciliated epithelial cell from the mouth, and a group of cells of columnar epithelium from the intestine of the frog. The various forms of epithelium are the most important tissue-elements of the body because they are most intimately concerned in all the functions of life, secretion, absorption, and excretion being effected by them. Concerning the origin of these elements, in common with the origin of every tissue-element of the body, I believe that much of that which has been written is simply nescience or a scientific display of ignorance. Any theory of the origin of any form of organic existence which fails to recognize the subjective condition of life must end in darkness and confusion. Dr. Atkinson, in a paper on "Epithelium" read before the New York Odontological Society, brushed away the cobwebs of the so-called "scientific" sophistry in referring to the assertions of eminent physicists and physiologists, that matter alone is sufficient to account for function, by saying that "their mistake is in the assertion that matter can be *alone* by any possibility." An explanation of the origin of all tissues as well as that of the function of all elements must be sought for in that living, germinal matter, wherein resides all power of differentiation and function. The modern physico-chemical doctrines fall far short of furnishing any intelligent explanation of the vital movements of bioplasm, as may be observed with a good magnifying power of 1000 diameters. The most interesting feature of ciliated epithelium is the hair-like filaments which project from the free extremity. These cilia are endowed with the power of motion, which continues for some hours after the removal of the cells from the body. They have a wave-like motion, striking forward from a vertical to a very nearly horizontal position and instantly returning. This form of epithelium is distributed throughout the whole extent of the air passages, from just within the nostrils to the termination of the finest bronchial tubes. It lines the upper two-thirds of the cavity of the uterus and the Fallopian tubes throughout. While ciliary action is not a primary vital movement, yet it is probably the result of movements or currents in the bioplasm. The late investigations of Flemming, Frommann, Klein, Heitzmann, and others, seem to prove quite conclusively that there is a fibrillar stroma or net-work within the bioplasm of all cells which may eventually throw some light upon ciliary action. There is but little definite knowledge concerning the function of ciliated epithelium. The fact that it is found in the uterus and Fallopian tubes has led to the supposition that it may be concerned in the functions of menstruation and impregnation. Conoidal epithelium lines the whole alimentary canal from the cardiac orifice of

the stomach to the anus. It lines the excretory ducts of all the glands, the male urethra and all ducts opening into it.

Fig. 6 shows two striated muscular fibers, with bioplasts from the newt magnified about 700 diameters. A completely developed muscular fiber consists of an envelope and contractile contents. The former, known as the sarcolemma or primitive sheath, is a transparent, homogeneous membrane supposed to be of connective-tissue formation. The characteristic peculiarity of voluntary muscular fibers are the striations or transverse markings, known as the light and dark zones. The bioplasts or nuclei, to which most investigators have given but little attention, are by Beale considered to be of the utmost importance. The continual growth or regeneration of the fibers is due entirely to these bioplasts. The development of striated muscle, as I have observed it in the human fetus, is by the union of simple, elongated filiform cells, the enlarged center of which consists of a mass of bioplasm.

Fig. 7 shows the development of bone, the formation of lacunæ and bone corpuscles from the osteoblasts.

Fig. 8 was drawn from a slide showing transverse section of the inferior maxillary bone of a cat with premolar tooth in situ. At *a* are seen two divided Haversian canals surrounded by their special lamellæ. The osteoblasts are shown at *b*, pericementum at *c*, cementum at *d*, and at *e* the dentine showing termination of tubuli. The bioplasm in the original of this view is unstained although showing quite plainly under a high power. These views are introduced solely for the purpose of showing the relation of the bioplasm, or living matter, to the formed material or definite tissue-structure.

We now come to the consideration of points of more special interest to us as dentists. Returning to the ovum, let us rapidly glance at the different stages of development through which it passes prior to the formation of the germs of the teeth. The ovum, as we have seen, is a simple cell or mass of bioplasm, surrounded by an envelope of non-germinal matter. All of these wonderful and complicated changes of progressive development which result in the formation of the various intricate organs of the body may be reduced to that one distinguishing property of bioplasm, viz: *the formation of new centers*, denominated in most works on embryology as the segmentation or cleavage of cells and their differentiation. The first effect of the fecundation of the ovum by the spermatozoon is the division of the original mass of bioplasm into two parts; these divide into two each, producing four, and so on, until the yolk is converted into an agglomeration of cells which soon take the form of a membrane, in the interior of which a fluid accumulates pressing it outward against the vitelline membrane which covers the yolk.

Granulations appear upon the latter membrane and it then takes the name of the "primitive chorion," while the membrane beneath it, produced by the original division of the cell, is called the "blastodermic membrane or vesicle." It is in or from this blastodermic membrane that the embryo is developed. This rudimentary tissue consists of three layers of cells or germinal plates. The upper is the corneous layer or epiblast, the middle one the intermediate plate or mesoblast, and the lower the intestinal glandular layer or hypoblast. From these the various tissues and organs of the body are formed. The physiological significance of the corneous layer or epiblast is very great. From it are formed the skin and its appendages, the cellular element of the glands of the skin, mammæ, and lachrymal organs. At a very early period a faint streak is observed upon that portion of the epiblast known as the "germinal area." This is the *primitive trace* or *groove.* On either side of this a rapid proliferation of cells occurs which form two ridges that rise up, fold over towards each other, and coalesce. Thus is formed the rudimentary spinal column, one end of which curves over to form the brain case. From this outer plate are developed, in addition to what I have mentioned, the elements of the brain and spinal cord, and the internal parts of the organs of special sense. I mention some of these familiar facts, not on account of any special interest which they present in themselves, but because of certain great and important questions which arise in connection with these developmental changes, to which I shall soon call attention. From the middle or mesoblastic layer are formed the whole group of connective substance, or tissues of support, muscular tissue, blood and lymph with their containing vessels, lymph-glands, including the spleen, etc. The epithelial cells of such tubes and cavities as are formed from this layer are called *endothelium.* From the hypoblast is formed the epithelium of the digestive tract, the cellular constituents of its various glands, together with the liver, lungs, and pancreas. The primitive dental groove, in which the germs of the teeth appear, is seen at an early period of intra-uterine life.

Fig. 9 is a drawing made from a section (magnified about sixty diameters) which was cut from the superior maxilla of a human embryo at about the fourth month of gestation. This section was cut on a line with the dental groove running from before backwards. The prominent germ shown is probably that of the canine tooth, which, although not the first to make its appearance after birth, is one of the first to begin formation. *A* represents the pavement epithelium; *b*, and *c*, the inner and outer layers of columnar epithelium inclosing *d*, the enamel organ. At *e*, may be seen the com-

mencing formation of other tooth-sacs. Observe the folding in of the columnar epithelium, inclosing a portion of the pavement epithelium to form the enamel organ. This part of the future tooth is formed from the epiblastic or corneous layer. It makes its appearance some time before the dentinal germ, which is developed from the mesoblast or middle germinal layer, is seen. This accounts for the non-appearance of dentinal germs at *e*, corresponding with the formation of the enamel organ. At *d*, may be seen the dentinal germ of the canine tooth, coming forward to meet with and be invested by the enamel organ. The space which appears between these two is probably caused, in part, by shrinkage due to the hardening and staining processes. The appearance of the dentinal germ, under a power of 1000 diameters, is that of a closely arranged congeries of round cells, a considerable portion of the interior being bioplasm or germinal matter. In all fetal tissues the proportion of the bioplasm to formed material is much larger than in adult life, when all the processes of growth and nutrition proceed much more slowly, and the demands of life then calling for the fixedness or stability of formed material. Surrounding the tooth-germ is a semilunar zone of cells apparently identical with those of the tooth germ proper. Around this zone, but not seeming to blend with it, is a loosely arranged system of connective tissue, becoming somewhat more dense where it surrounds the outer layer of columnar epithelium of the enamel organ. The dental germ is probably developed from the connective tissue, although the cells of the two tissues as seen in this view present a very marked difference. But good authorities claim that the original form of the connective-tissue cell is spheroidal, which is the form of the cell in the dental germ. At *f* are seen points of ossification of the superior maxilla. All of the tissues shown in the upper part of the cut—the dentinal germ, the connective tissue surrounding it, and the bone—are products of the middle germinal or mesoblastic layer. As development proceeds, blood-vessels penetrate the dentinal germ, and the cells on the outer part of the germ are observed to arrange themselves in a regular layer, the outer portion of the cells assuming a pointed form and rapidly developing into the *odontoblasts*. From this layer of cells is developed the future dentine of the tooth. The formation of the enamel has proved to be a difficult subject to investigate. I have made many fruitless attempts to obtain a section of the tooth germ after the formation of the enamel had commenced. The first and greatest difficulty was in hardening the specimen so that the tooth germ could be cut without being torn to pieces by the yielding of the soft tissues which surround it. The second difficulty was in procuring a section knife or razor which would cut through even a

thin wall of newly formed enamel. My first successful attempt was conducted in the following manner: I obtained a fetal kitten shortly before birth, and, after opening the thorax, I injected the head through the carotid arteries with carmine gelatin. The jaws were removed, a portion of the lower one placed in a freezing microtome and the apparatus was then put in a box and covered with pounded ice and salt. After remaining there twenty minutes it was removed and the section of jaw was found to be quite solidly frozen. The microtome was fastened to my work table and a few thin sections cut with a thick, heavy razor. I obtained one good section in that attempt and have since cut several others. A drawing from one of these is shown at Fig. 10, magnified sixty diameters. The injection penetrated the blood-vessels very finely and left nothing to be desired in this direction. The vascular germ or pulp is shown at *a*. At *b*, the odontoblast or dentine cells show very plainly their elongated points forming the fibrillæ or contents of the tubuli. These specimens confirm everything which Dr. Bödecker and Dr. Abbott have written concerning the dentinal fibers penetrating the enamel without any break in their continuity. The dentine is a secretion of the odontoblasts, and may be called the intercellular substance, or, as I prefer to say, *it is the formed material which originally existed as germinal matter or bioplasm within the odontoblasts.*

Now, concerning the calcification of the enamel, I have no clear, definite ideas or settled convictions. Some points in my own observations would seem to confirm Dr. Garretson's views that the enamel is a secretion of the odontoblasts, which is modified in passing through the primary sac. The fact that the fibrillæ penetrate the enamel without break of their continuity, and that all nutritive material for the regeneration and continued support of this tissue must come through this source, would seem to confirm this opinion. But the occurrence of villous projections of the inner layer of the connective-tissue envelope surrounding the original tooth-sac, directed towards the surface of the enamel organ, and the fact that there is a rich plexus of blood-vessels, the remains of which are shown at *e* in Fig. 10, traversing the whole parietal portion of the dental sac are matters of no small significance.

The enamel prisms are undoubtedly the transformed columnar epithelial cells, and calcification is in some way effected within the enamel organ.

In briefly reviewing the salient points of this paper, I may say that there is one great and important idea which I have attempted to keep in view, viz.: that in the beginning of physical life, whether we use the term in a general or in a particular sense, there is a certain point where the dead matter of pabulum is changed into the living,

vital, germinal matter of life. I have said that the radical and wonderful developmental changes which occur in the embryo suggest questions of the utmost importance, and in closing I wish briefly to call attention to these points. We have seen that such widely different structures or tissues as the skin, enamel of the teeth, and serous membranes are formed from that part of the original blastodermic membrane called the epiblast, while blood and bone, lymph-gland and muscular tissue are simply the transformed mesoblastic layer. Now, what is the nature of that force which determines these wonderful changes? Our materialistic physicists and physiologists urge that these mysterious phenomena must be accepted as the ultimate facts of science. On the other hand they argue that every change in matter has its origin in some antecedent change. But who has ever been able to trace and connect these changes, and show how or in what way certain changes are dependent upon antecedent changes. The truth is that in all the phenomena of life there are two factors—the objective and subjective. Life is not the cause of form in organisms—*it is the form itself.* It is the living, substantial, although invisible entity which is within every nerve, muscle, and fiber of the human organism, the growth and development of which, although antecedent to that of the material body as a cause, yet is coeval with it in time.

REGULATION OF TEETH MADE EASY BY THE POSITIVE SYSTEM.

BY J. N. FARRAR, M.D., D.D.S., NEW YORK CITY.

(Continued from vol. xxiii., page 575.)

No. XVII.

Adjustable Spreading Machine for Widening the Arch.

In the movement of several teeth at the same time, and included within the same yoke, it sometimes happens that one or more of them will move more rapidly than the others, rendering the case somewhat awkward if not vexatious to manage by the use of old-fashioned devices, and making it necessary to remove the mechanism for readjustment, and perhaps requiring more or less alteration in it in order that the bearings may fit properly, and possibly necessitating an entirely new apparatus.

To show how such difficulties may be readily surmounted will be the object of the present paper. Anything which will meet such varied requirements may be somewhat complicated, but a proper combination of mechanical principles is essential.

Fig. 107 illustrates one variety of such adjustable apparatus. The chief merit of this class of regulators are the ease and rapidity with which the direction and degree of force may be shifted from one point to another along the line of the several teeth without removing the appliance from the mouth. For convenience of explanation the apparatus illustrated, which is intended for moving the bicuspid and first molar teeth of each side of the upper jaw, will be considered under three divisions. First, the yoke-clamps; second, the jack-screw; third, the adjusting portion connecting the other two.

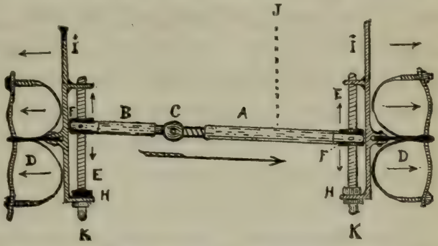


Fig. 107.

First. The yoke-clamps are in one sense auxiliaries to the apparatus proper, for the reason that their office is simply to hold it in position and to prevent it from slipping off. They are nevertheless indispensable in cases where simple impingement is impracticable. In construction the yoke-clamps may be made adjustable through the agency of oval holes in the bar allowing the little screws which pass through them to play one way or the other so that the bows may be fitted to different sizes of teeth. As the construction of these clamp-bands in principle has been explained in the DENTAL COSMOS (page 74, February, 1879), and is also shown in the accompanying figure, it is not necessary to further describe them.

Second. The jack-screw. The motive power portion, J, is of the cylindrical variety in formation, in order to render it less liable to be rotated out of order by the motion of the tongue, an agency which is more mischievous than would at first be suspected. (See paper No. XVI.) The extremities, A, B, of this jack-screw are bifurcated in such a way as to grasp and hold on to the nuts, F,F, of the adjusting portion of the apparatus. These nuts will be explained further on.

Third. The adjusting portion, E, I, H, F, unites the yoke-clamps and the jack-screw portions in such a manner that the ends of the jack-screws may be moved by means of screws, so that the direction of the force may be changed at will by the use of a key as easily as the winding of a watch. This adjustable portion consists of the frames, I, I, made of a strong narrow strip of gold plate or half-round wire, of sufficient length to rest against the inside surface of the bicuspids, and, should it be desirable to move the first molars, long enough to bear against them also, as shown. At right angles with each of these bars and pointing toward the median line of the mouth are two projections, with a hole in each, through which

pass screws, E, E, which are held in place by fixed collars, H, H (one on each side of these standards). One extremity, K, of each screw is made angular to fit a watch-key.

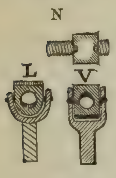
These screws answer as tracks upon which play loose nuts, F, F, which are carriages upon which rest and ride the extremities of the jack-screws before referred to. These nuts should be of sufficient size to fill the space between the track-screws, E, E, and bars, I, I, so as to snugly rest against the latter, in order to prevent the track-screws from becoming bent and getting out of order when the force of the jack-screw is applied.

This adjustable portion of the apparatus may be screwed to the yoke-clamps about the teeth in various ways. The simple hook, hinge, or rivet is practicable, but some form of lock-socket is better. Whatever kind of connection is used, the bars should be confined to the yokes in a loose manner, yet sufficiently tight to prevent the adjusting portion from tilting out of place. This may be done by little lugs from the bows through or around the bars (not shown in the diagram).

To operate the entire apparatus, first fix the yoke-clamps in place about the proper teeth; then annex the adjustable portions, if not already fixed to them; and finally insert the jack-screw; after which, lengthen it until it snugly embraces the nuts, F, F, within its bifurcated extremities, so that it cannot be easily dislodged.

To change the direction of the jack-screws upon the teeth, turn the track-screws, E, E, with a watch-key applied to the nibs, K, K. This causes the nuts, F, F, to move backward or forward upon the screw, causing the jack-screw which rides upon them to change position. In this way the direction of the force may be given transversely or diagonally across the mouth, as desired. The *degree* of force against the teeth, of course, is governed by the jack-screw.

Fig. 108.



There are two methods of connecting the jack-screw with nuts, F, F,—fixed and detachable. L, Fig. 108, represents the fixed variety as playing on pivots or a rivet through holes in a U-shaped frame which is soldered to the extremity of the jack-screw. This formation gives a loose yet positive hold and answers the purpose well, but should the adjustable portion be riveted fast to the yoke-clamps, and it become necessary to remove the jack-screws from the mouth, the other parts of the apparatus would necessarily follow with it. V represents a better method of construction; for by it the jack-screw can be detached and removed at any time without disturbing the other portions, by simply shortening it. This peculiar form of nut is shaped with prominences

on the sides (see N, Fig. 108) which fit about the bifurcated extremities of the jack-screw and prevent them from slipping off.

Should the adjusting portions be joined to the yoke-clamps by a socket, however, the first-mentioned method will be equally useful, as the disconnection will take place between the adjusting portion and the yoke-clamps. If the entire apparatus be properly made, not only may the jack-screw portion be easily and speedily removed independently, but the adjusting portion also, leaving only the yoke-clamps remaining on the teeth.

This apparatus might at first seem uncleanly, but all that is necessary to clear it of food is to rinse the mouth with water. Will such an apparatus as described be inconvenient to wear? Yes, somewhat; still the positiveness of its action, its comparatively painless management, even by the patient, makes it acceptable to the wearer, while its efficiency cannot but be satisfactory to the practitioner.

(To be continued.)

ANOTHER CORRECTION.

When I called Dr. Flagg's attention to some statements he had made in the October number of the Dental Cosmos in reference to some action taken by the faculty of the Philadelphia College of Dental Surgery in its attempt to prevent Dr. Arthur from teaching "false doctrines," it was not my desire to go into a discussion of any other point in his article. I stated that I had no recollection of any action taken by the faculty to silence him; that I could find no mention made of it in the minute-book of the college or in the minute-book of the Pennsylvania Society of Dental Surgeons; and had inquired of some who were Dr. Arthur's most intimate friends and associates, and from no source could I find any evidence that any action had been taken. I therefore concluded that Dr. Flagg had been mistaken in the case. Now, as Dr. Flagg still persists in his statements, and brings forward to sustain him an account which he says was written by his father between 1856 and 1860, it is therefore necessary that other evidence should be given to correct the statements, and in order to do so we must review the relations Dr. Arthur sustained with members of the faculty before and after he became a member of it. Dr. Arthur was not a stranger; some of his most intimate professional friends and associates resided in Philadelphia, and he paid frequent visits to them; he assisted in organizing the Pennsylvania Association of Dental Surgeons in 1845, and was an active member and contributor to it, so that when, in 1851, he published his method of leaving decay in the cavity, under *certain conditions*, when preparing to fill, his process was well known to the

several members who afterwards became the faculty, and is it not strange that in 1852 they should select him to fill the chair of Principles of Dental Surgery and teach the very principles he (Dr. Flagg) says they objected to. Again in 1854 when Dr. Flagg, Sen., (I shall call him Dr. Flagg, Sen., to designate him from his son, Dr. J. Foster Flagg) came into the faculty he made no objection, and in the spring of 1855 he voted for Dr. Arthur for dean, who could not have been elected without his vote. And when in 1856 the faculty of the Philadelphia College left in a body and organized the Pennsylvania College, Dr. Arthur was selected to fill the same chair and teach the same practice; he was also elected dean. I think the above should satisfy any disinterested person that the position of Dr. Arthur in the faculty was not what Dr. Flagg represents it to have been.

Now, let me call attention to his social position. From the fall of 1854 to the spring of 1857, Dr. Arthur, Dr. Flagg, Sen., and I met every Saturday evening; sometimes a friend would join us, but very seldom. These were not faculty meetings; they were not intended to have any connection with the college. At these meetings matters pertaining to the college were frequently discussed, and I recollect on more than one occasion Dr. Arthur's position was discussed, but it was always in the most friendly manner. Dr. Flagg, Sen., and myself differed with Dr. Arthur about the propriety of leaving decay in the cavity, but it was an honest difference of opinion, expressed in mild terms and tone of voice. Any one who has the least knowledge of Dr. Arthur's peculiar disposition will know at once that if there had been any excitement in the discussions it would have put an end to the meetings, and yet they continued until near the time Dr. Arthur left the city.

Now, this is very different from Dr. Flagg's report. If he had been describing a *tornado* he could not have used stronger language than "contemptuous silence." Then "the schism began to grow; personal animosity was enlisted against him; not one professor, but *four*, comprising the entire remaining members of the faculty, were arrayed against *him*. It was no magazine correction which was brought to bear to crush him, but a formal charge of false teaching was made, and he was required to defend his position before the trustees of his institution." What more serious professional charge can be brought against a teacher than that of teaching false doctrine? and do not the trustees constitute the tribunal of last resort?

All this was in Dr. Flagg's imagination; it never took place at all. In another paragraph he tries to discredit the books of the college and society, and also the proceedings. These he knows nothing about; he was not a member of the faculty, and he has never seen

the books. All these are gratuitous. I can inform him that I have the minutes of every meeting of the faculty from the time his father entered the college until he left it. If he can show any meeting that is not recorded I will acknowledge that I am wrong. And he says his father left an account of what transpired between 1856 and 1860, and that the proceedings took place in the Philadelphia College. Now, he has a very small margin to work on here. The Philadelphia College went out of existence the 29th of February, 1856. It is hardly likely the faculty would proceed against Dr. Arthur when they had a controversy on hand which ended in all the faculty leaving that college. And he says his father's account extended to 1860. His father resigned June, 1858, and from that time to 1860 he had no connection with the college. The probability is that his father wrote his account in 1858, when he would not be very likely to give a favorable report; or, he may have written it after smoking a strong cigar at one of those social meetings. But perhaps the best argument that can be offered is Dr. Flagg's own testimony, which is published in double columns, his favorite way of comparing statements:

And I also referred to the action of the faculty of the Philadelphia College of Dental Surgery in its attempt to silence Prof. Arthur and prevent him from teaching false doctrine.

At first the statement of Prof. Arthur was treated with contemptuous silence. He had made war single-handed. In this wise alone he continued his demonstrations. At last the schism began to grow; personal animosity was enlisted against him, and not *one* professor, but *four*, comprising the entire remaining members of the faculty were arrayed against him.

It was no magazine correction which was brought to bear to crush *him*, but a formal charge of "false teaching" was made, and he was required to defend his position before the trustees of his institution.

I derived my information in relation to the official antagonism to Prof. Arthur from a very elaborate account written by my father.

According to my father's account, the attempt to silence Prof. Arthur was commenced in faculty meeting; was sustained by *four* opinions against *one;* was met by Prof. Arthur with a firm and decided assertion of his intention to continue from "conscientious convictions" his objectionable teaching, and it was settled positively, though informally, that "no interference could be permitted with any teaching though opposed to generally received views, unless such could be *proved* fallacious."

It will be noticed how positive he is in the first statement, not only using strong language but putting many of his words in italics, to give them more force, and in the second he is so mild that if it had been published first no notice would have been taken of it. There are some discrepancies about the trustees also that he has left out in his later statement.

In conclusion, he says he is quite sure that there are no "minutes" of the long conversations we had in regard to this and many other affairs. No, I admit that I have no record of these conversations, nor do I know anybody who has. The nearest I can come to it is the suggestion that he probably refers to the winter he attended lectures with about forty others and heard Dr. Arthur give his views. He probably had his dental spy-glass, with Dr. Arthur at one end and he at the other. I suggest that this might have been so; I do not know it as a fact. T. L. BUCKINGHAM, D.D.S.

CLINICAL REPORTS.

PHILADELPHIA DENTAL COLLEGE.

CLINICAL SERVICE OF DR. M. H. CRYER.

REPORTED BY J. A. HARTMAN.

AT the request of Professor Guilford to give a clinic on operative dentistry, this patient is brought before you for the purpose of showing the operation of filling teeth with gold, and to explain a course of treatment pursued in a case which has had many complications.

Before adverting to the history of the condition let us recognize that there is a wide difference of opinion as to the correct meaning of the terms, operative and mechanical dentistry. Noted dentists of this city claim that they accept operative work *only*. Now, these so-called exclusively operative dentists are too often but mechanical workers. Is not the filling of a simple hole in a tooth or the forming of a mass of gold into the shape or contour of a tooth mechanical work? Further, you who have tried it are aware that the making of an artificial denture, with a band and single gum teeth soldered to a gold plate, the latter by means of stays, requires more skill than the making of such fillings as are alluded to. To learn to do this so-called mechanical dentistry properly takes ten times as long as it does to learn to fill teeth with gold. Six years intercourse with dental students has established this conviction. You will understand that true operative dentistry is the bringing of teeth from a pathological to a physiological condition for the ultimate reception of the mechanical treatment.

Through the patient before us you may have an illustration of what is operative and what mechanical dentistry. This gentleman, after having been under treatment for many months by a member of the medical profession for facial neuralgia, applied for dental services on the 19th of October. An examination of the mouth

showed many decayed teeth, several with putrescent pulps, some with these organs exposed and inflamed, and a few devitalized having open canals. Here was abundant cause for the trouble afflicting the patient. According to the teachings of Professor Garretson, when a cause of irritation is found, the treatment is to remove it and restore a physiological condition. The first right superior molar had a gold filling in the crown, and a large oxychloride-of-zinc filling on the mesial face; it was the tooth which appeared to cause the most disturbance; it was painful, elongated, sore on pressure and to tapping with an instrument, and the color gave evidence of a putrescent pulp. The patient said that when the oxychloride of zinc was inserted the pulp was alive and that the filling caused pain. Putrescent pulp was diagnosed. Professor Flagg teaches that the first and most important thing to do, where we have conditions begotten of a putrescent pulp, is to give relief in the gentlest possible manner. To effect this he drills into the pulp-cavity from a point where the operation gives least pain, and which at the same time enables him to cleanse the nerve-canals with most thoroughness, when the proper time for such operation has arrived. The oxychloride filling in the tooth under consideration was the spot indicated, as it was easy to drill through the plastic filling, and the position was the right one to secure the entrance required.

Selecting a sharp spear-pointed drill the work of relief was begun. Always select very sharp drills for this operation and give the tooth all possible support. Drill carefully, and as you approach the pulp-chamber increase the caution, it being possible that the diagnosis may be at fault and instead of a dead and putrescent pulp a live one be found. As the drill, in this instance, went in through the oxychloride and into the stratum of dentine beyond, coming nearer and nearer to the pulp-chamber, there was no sensation; finally the instrument passed into the chamber, and on withdrawing it the odor of a putrescent pulp escaped, confirming the diagnosis and giving immediate relief. A small piece of cotton was placed loosely in the opening merely to exclude débris, without preventing the escape of the mephitic gas.

The patient was dismissed with instructions to come back on the following day. On returning, the tooth having given no trouble, and the soreness having in a great measure subsided, all the oxychloride was removed, the pulp-chamber fully opened, the débris from about the mouths of the canals was removed, care being taken not to impact anything in them. A small piece of lint, this time slightly medicated with carbolic acid, was placed in the cavity and the orifice filled with cotton and sandarac. On the third day the

canals were opened as far as practicable without going through the apical foramen and again dressed and closed as before, only more firmly. Two days later this dressing was removed; meanwhile the tooth had given no trouble and was without odor. Next, packed the canals solidly with carbolized cotton. In the pulp-cavity there was placed a gutta-percha temporary stopping. During these visits the right upper cuspis was found to have a cavity on the disto-lingual surface in which the pulp was much exposed, inflamed, and aching. For this the treatment was an application of acetate of morphia and carbolic acid on cotton, the cavity being closed with cotton and gum sandarac varnish. On the following day the tooth was quite comfortable. Soon after that arsenical paste was applied, and, as the cavity extended up under the free margin of the gum, gutta-percha was used as a temporary filling to prevent the escape of the paste, thus avoiding harm to surrounding tissue. On the following day the pulp was found devitalized, and removed. The canals were cleaned out at the same sitting and filled solidly with cotton moistened in carbolic acid and the whole cavity with gutta-percha. This cavity was in such condition that it could have been filled permanently at once with gold had it not been considered of more importance to get other equally diseased teeth into healthy condition. The left superior central incisor was found to be in the same condition as the canine, and its treatment was identical, the same success being obtained. The left superior lateral incisor had a cavity on the mesial surface extending into the pulp-chamber, the pulp having been dead about a year, and the tooth having been open all that time without treatment. Here was a part to be approached with hesitation, for it had always been and was still comfortable. Interference might cause more trouble than the patient had yet experienced in this tooth, for the laterals are most likely to take on pathological disturbances and are most liable to give trouble during treatment and after filling. With a small scoop excavator all the decay in the chamber was removed, care being taken to impact nothing in the canal. [Dr. Cryer remarked, parenthetically, that the dental engine should rarely be used at this stage, for fear of impacting débris in the canal.] Cotton being placed very loosely in the cavity, the patient was instructed to remove it at once should he become conscious of the presence of the tooth. The after treatment was the same as that pursued in the case of the first right superior molar, great care being taken not to close the cavity too soon. The left superior second bicuspis was found in the same condition as the lateral. The treatment and result were the same. The lower right first molar had the pulp largely exposed, giving trouble from contact with food and drink. Not wishing to destroy

the pulp at this time the detritus was cleared out, and the cavity filled with gutta-percha, without using any medicaments. Particular care was taken that the gutta-percha should not be too warm—test on the back of the hand for temperature before inserting. This tooth is as comfortable now as it has been since the plastic was put into it three days ago. This temporary filling will be allowed to remain as at present until the pulp gives trouble or until time is found to treat and fill permanently. Now the greater number of this patient's teeth are in a fit condition for the manipulations of the *mechanical* dentist.

The lecturer advised familiarity with many tooth medicaments, but the use of few; the trial of new ones gradually, with dependence, on those which experience shows to have done the most good service in the past.

Question by a member of the class—"Why would you not apply arsenic to an inflamed pulp?"

Answer. "Because arsenic acts as an additional irritant on an inflamed pulp, and it is rarely effective if applied under such circumstances. First reduce the inflammation and then apply the medicament. The ordinary formula for arsenical paste is, arsenious acid ten grains, acetate morphia ten grains, carbolic acid sufficient to make a paste; but I prefer to use four times as much of the acetate of morphia."

Question. "Is carbolic acid the best medicament for treating pulp-canals?"

Answer. "I have been successful with it in this and in many other cases. I do not like glycerin or oil of cloves on account of their oily character."

Question. "What do you cap an exposed pulp with?"

Answer. "I am not an advocate of capping, but when the pulp has given no trouble and is *very little* exposed I use an oxychloride cement. If the pulp dies under it, the cement has often the power of mummifying it. This cement will give pain, but if not used for a little while after mixing the pain will be much less severe upon its application, being decidedly more bearable. I also use gutta-percha for capping."

The lecturer proceeded: "I shall now fill this superior right first bicuspis. The cavity is in the mesial approximal portion, extending from the middle of the grinding surface to the cervical edge, under the free margin of the gum. First removing the temporary filling, I shall insert a napkin with a view of catching the gutta-percha chips as they fall from the instrument. Having been previously excavated the cavity needs scarcely any trimming. Next I shall put on the rubber dam."

Question. "Why not put on the rubber dam before removing the temporary stopping?"

Answer. "Because the temporary stopping has been so made as to push aside the gum at the neck to give ready access to the cavity when removed; this overhanging filling-material would have prevented the proper adjustment of the rubber.

Medium rubber is generally the best to use. Waxed floss silk is to be preferred for ligatures because it is always ready for use, any length desired can be cut off, and it will go between teeth that are very close together. Tie the ligatures by passing the end twice, as in the first half of the surgeon's knot, thus forming what might be called the twin knot, leaving the ends long, passing them back and fastening them to the retractors. Retain them thus to act as 'tell-tales,' as Dr. Flagg calls them.

For trimming edges of cavities, which ought to be slightly beveled so as not to be marred in filling and for giving a better finish, nothing is so well adapted as an ordinary light chisel or the scoop excavator, according to locality. Double nought (00) emery cloth and Smith's approximal trimmers are nice means for smoothing the edges after chiseling. Always cut away the cervical edge until you come to solid structure, then make a shallow groove back of the edge of the cavity to retain the filling-material. In this cavity I shall make one commencing-pit. Never undertake to hold a filling in the cavity by retaining-points. Do not strike a sulphur match near your gold as you are apt to impair the working qualities of the metal. I was taught not to use automatic mallets indiscriminately, but I have three of them; two hand, and one Holmes engine mallet. The reason for owning so many is not to lose time in changing points. Instead of using weights a second pair of retractors will secure the lower ends of the rubber sheet. I shall use for this cavity crystal-foil cylinders. Cylinders, as thus prepared, have the double advantage of being ready for use, and being of assorted sizes the diameter needed can be selected and placed and larger or smaller rolls used to fill in where needed. The first few cylinders should not be annealed. Commence by fixing one in the starting-pit. Care must be taken to pack the gold against the cervical wall and steady it with an instrument until it sustains itself. After the cervical portion is well secured fill up gradually the balance of the cavity; see that the gold goes against all the walls, and that each piece is properly condensed before the next is placed in position."

PROCEEDINGS OF DENTAL SOCIETIES.

AMERICAN DENTAL ASSOCIATION—TWENTY-FIRST ANNUAL SESSION.

Third Day.—*Afternoon Session.*

On motion of Dr. Abbott, a committee of three, consisting of Drs. Abbott, Litch, and Friedrichs, was appointed to draft resolutions expressive of the sense of the association regarding the assassination of President Garfield.

Dr. Bödecker exhibited LaRoche's saliva-bag, and showed the method of using it. He commended it warmly, and offered a resolution that dental manufacturers be requested to place it on the market.

Dr. Mills had been informed that there was a movement among officers of the army looking to the introduction of a petition to Congress asking for the appointment of surgeon-dentists in the army. It was probable that if the movement was successful similar action with regard to the navy would be taken. He offered a resolution commending such a step.

Dr. Atkinson moved that a half-hour be set apart to hear Prof. J. R. Buchanan read such portions of his paper as pertain more strictly to the field of the dentist. Adopted, and from nine to half-past nine o'clock Friday morning was named as the time.

The discussion of Dr. Davenport's paper on the "Etiology of Chemical Abrasion of the Cutting-Edges of the Front Teeth" was opened.

Dr. T. H. Chandler said the paper seemed excellent so far as it went, but its author was on the wrong track when he applied the term "spontaneous abrasion" to the condition he described. He has not hit Harris's definition, which was used with reference to an entirely different condition. He (Dr. Chandler) has two patients engaged in the manufacture of acids. They were put into the laboratory as boys by their father to learn every step of the business they were to follow. Their teeth were affected very much the same as those described by Dr. Davenport, but it was not Harris's abrasion. In these cases the line of abrasion extends diagonally across the labial surfaces of the front teeth; Harris's abrasion is on the ends of the teeth. He also has two patients, one a clergyman, the other a bank cashier, who are innocent of acid-contact. These have the condition described by Harris. Wherever you find this on the front teeth you will also find that in the molars and bicuspids the center of the cusps is eaten out. The line above the enamel does not seem to be touched. Harris calls this "spontaneous abrasion." The other condition is due to the action of the acids.

Dr. Atkinson has seen a number of these cases, but he has seen some much more ambiguous than any that have been described. He has seen mouths in which there was an S-shaped excavation cut all around about the line of the gum on the bicuspids and molars and cuspids, but not on the incisors. The surfaces were so handsomely finished that he had desired to finish the disintegrated enamel as nicely. He has resorted to filling, and in the majority of cases this has been successful; he has never known the disease to recur after the second attempt at filling. The form described by Dr. Davenport is simply chemical solution, of which we have abundant proof in the conditions found in the mouths of habitual orange- and lemon-suckers. Do we know it is an acid which causes it? He would prefer the term solvent or disintegrant, for we are very far from scientific accuracy in boldly asserting that acid does it.

Dr. W. C. Barrett said the etiology of these cases is so lost and the symptoms so varying that he had no theory by which to account for them. He has two patients of this class, one a young lady, the other old. In the young lady there is a very deep furrow clear across the tooth; in the old lady there is a circular spot in the center of the tooth. In the young lady the parotid saliva is distinctly acid; in the other case it is as distinctly alkaline.

Dr. Litch stated that whatever might be the truth in regard to other forms of destructive metamorphosis in tooth-tissue, that form known as erosion seemed unquestionably to require a vital condition of the tooth-structure for its development. He had never seen a fully characteristic case of erosion in a devitalized tooth. He thought erosion might well be denominated an atrophy, induced by some as yet undetermined exciting cause or causes.

Dr. Geo. H. Cushing corroborated Dr. Litch's statement with reference to the apparent immunity of dead teeth from abrasion. He has a patient in whose mouth all the teeth on one side as far back as the second bicuspid are affected, except the central incisor, which is devitalized.

Dr. W. H. Fundenberg, Pittsburgh, had put the teeth of one of his patients in perfect order, and in one year afterwards the teeth became very sensitive, and on examination he found this action breaking down nearly every tooth below the gum. He knew of no reasonable explanation of the condition. The patient is a man of good health, who has never dealt in acids; he is an editor, and his teeth were very strong.

Dr. A. H. Brockway, Brooklyn, had a case about nine years ago nearly similar. When he first saw it the teeth were apparently perfect. A closer examination showed grooves around the necks of the teeth. The condition embraced all the superior teeth except

the molars, and included the lower bicuspids and molars. The grooves were almost entirely under the gum, and of very recent development. He learned that the patient's general health was good, but that he had a little kidney trouble, for which he had consulted a physician. That seemed to point to an explanation of the condition. He sent the patient to a physician who treated him for the kidney trouble and cured it. Dr. Brockway then put the teeth in proper condition, and for two years' following there were no further symptoms of the trouble. Since that time he had lost sight of the case.

Dr. G. F. Waters. A year ago last October a sea captain called to have his mouth attended to. He had the condition described by Dr. Fundenberg, decay under the gums, with an accumulation of tartar on some of the teeth, with the gums separated. He had never been confined to his bed by sickness in his life, but he had had kidney trouble. The teeth were filled with oxyphosphate. In only one tooth had the pulp to be treated. From this about a quarter of an inch of very fine fiber was removed. A year later the patient returned with the tooth whose pulp had been treated broken off. An artificial crown was placed on it, and he heard no more of the patient until he saw a statement that he had died from the effects of arsenical paste used in his teeth. The patient also had trouble with his liver.

The subject was passed, and Dr. Barrett's remarks on "Anesthesia" were discussed.

Dr. Litch thought Dr. Barrett took the right view in saying that the anesthesia produced by nitrous oxide is a specific effect of the agent on the nervous centers. There is no question that N_2O is a definite chemical compound. It can be decomposed by the action of heat, but the degree of heat requisite far exceeds the normal temperature of the body. Hence the idea that it can be decomposed in the lungs, and free oxygen produced, resulting in a condition of hyperoxidation of the blood, is preposterous. The fact that it remains N_2O in the system, and produces its effects as N_2O is proved by its being eliminated as N_2O. According to Dr. Evans about three quarts remain in solution in the blood at the time of complete anesthesia. He thought Dr. Barrett hardly justified in claiming a weak potentiality for nitrous oxide. Neither ether nor chloroform, even when their pure vapor is inhaled, produces complete anesthesia in so short a time as nitrous oxide. It is true that when its exhibition is discontinued, consciousness and sensation are restored as rapidly as they have been lost, but this is due, not to its weak potentiality, but to its rapid elimination from the system. If duration of the anesthetic effect be taken as the index of potentiality, then alcohol is

the most potent of all anesthetics, for alcohol-narcosis, with its profound anesthesia, will often last for hours. This matter of duration of effect seems to be in a measure dependent upon the physical structure and method of administration of the agent employed. Thus, alcohol is a liquid, absorbed into the circulation from the digestive tract; it must there remain until eliminated by the excretory organs, or consumed in the system by a process of oxidation. Ether, a more volatile liquid, closely allied as it is chemically to alcohol, will, when administered by the stomach, produce almost precisely the same line of physiological effects as alcohol; but the duration of its influence will be not longer than an hour, even when given in large doses. But when ether vapor is administered by the lungs, the physiological effects while almost the same as before are still more transient; a result clearly due to the form and manner in which the drug is administered: the vapor easily escapes from the blood and lungs. Nitrous oxide, being a highly volatile gas, escapes more readily and rapidly than ether, while the effects of the heavier vapor of chloroform are more prolonged. To this rapidity of elimination characteristic of nitrous oxide is doubtless due in a measure the comparative immunity from a fatal result which has attended its administration, although this is, of course, more due to its chemical constitution, as is the case also with ether vapor; the chlorine element in chloroform rendering it the most dangerous of all. Darin's statistics show a ratio of one death in 2872 administrations of chloroform; one death in 23,203 administrations of ether, and one death in 100,000 administrations of nitrous oxide. Prof. Bartholow sums up thus far 500 deaths from chloroform narcosis. While but four fatal results have attended the administration of nitrous oxide, the fact must be borne in mind that very many persons claim to have had their health permanently impaired by its use as an anesthetic. The late Prof. Geo. T. Barker held very pronounced views upon this point with reference to his own case. These may all be instances of *post hoc, propter hoc;* but further light is needed upon this subject, and it would be well for the dental, as well as the medical profession to bear in mind the possibility of danger from this source. Of the almost absolute safety of this, when properly administered, there is now but little question, while except in obstetric practice, the use of chloroform is being rapidly discarded.

Dr. Barrett. Some points brought out by the discussion I should like to have cleared up. I said that the comparative immunity from danger in the administration of nitrous oxide was due to the lack of potentiality in the gas. Dr. Litch says it may be due to its ready elimination from the blood. I question that. The others being less soluble in the blood would be more readily yielded up. I

believe that its safety is due to its weak potentiality as evidenced by the fact that to produce complete narcosis it is necessary to shut off the air completely and overwhelm the system with the gas, so that as much as possible may be taken into the blood. In all cases the anesthetic effect is shown first at the periphery—not at the nerve-centers—and it proceeds inwards. In the exhibition of woorari the exactly contrary effect is seen. The anesthesia begins at the centers and goes thence to the periphery.

Dr. Buckingham. Every chemical compound is definite. Wherever you find it it is always the same. N_2O is nitrous oxide, a definite compound. Matter going into the system acts by its mere presence or by being decomposed. Some narcotics act on one organ, some on another. We have three anesthetic agents, which are entirely different in their characteristics, but which act in the same way. Nitrous oxide supports combustion; ether will not support combustion, but it will itself burn; chloroform neither supports combustion nor will it burn. Now do they act upon special organs, or are they decomposed, and do they then act upon the molecules, stopping molecular change? The fact is that we do not know anything about it.

The section was passed, and Section VI., Pathology, Therapeutics, and Materia Medica, was called. Dr. Odell, chairman, made a verbal report, asking for further time, which was granted.

Section I., Artificial Dentistry, Chemistry, and Metallurgy, was called, and Dr. Stockton read the report, which announced the papers to be read.

Dr. John Allen read a paper on "Artificial Dentistry as a Fine Art." The principal points enforced were:

The time has come when the reproduction of the natural form and expression of the human face should be regarded as one of the most important points to be attained in artificial dentistry. To do this requires the glowing spirit of art to conceive what is to be done in each individual case; to observe nature and catch the different expressions which are so evanescent that they would escape notice but for the knowledge of their source. A thorough knowledge of the anatomical structure of the human face is one of the first requisites, and to imitate nature should be the fixed rule. In the construction of artificial dentures, the dentist should study the form, proportion, and expression which previously existed in the physiognomy of his patient, that he may be able to restore that harmony of the features which will prove true to nature. In proportion as this result is attained, this branch of dentistry becomes an art, and is appreciated accordingly. Care and skill in minute detail are much more important in efforts to restore the natural form and

expression of the face when marred by the loss of the dental organs than in other realms of art. Artistic taste and skill far above that tame and lifeless style which renounces truth of expression and character of the features are requisite. In order that this branch of our profession may avoid degeneracy of taste and poverty of conception, it must be based upon purely scientific and artistic principles, for it is upon these that we must depend to produce a pleasing, natural expression; otherwise the result shows that the artist was not there to preside over the operation. In the construction of artificial dentures, the following requirements should be kept in view: 1. To have the plates perfectly adapted to the mouth of the patient. 2. To let every tooth represent its proper class and character in reference to length, form, size, shade, position, and expression. 3. To see that the gums, roof, and rugæ of the mouth are truthfully represented. 4. If any or all of the muscles of the face have become sunken they should be raised or restored to their natural contour. 5. To make the lingual surfaces of such form as to produce no impediment in the speech of the wearer. All these requirements should be so perfectly blended together as to present symmetry of form and natural expression.

Dr. Geo. F. Grant read a paper entitled "Dental Prosthesis; its Relation to Articulate Speech." The voice, he claimed, is an important factor in the establishment of individual identity, sometimes remaining after all the other means of identification have faded from our memory. While peculiarity of tone-quality or *timbre*, as it is called, is not equally marked in all individuals, it is an undoubted fact that it is one of the most important means for the determination of identity. A change in the voice, perhaps more forcibly than any other alteration of individual characteristics, reminds us of its existence. We may shut our eyes to other defects, but our ears are ever open to a change of voice, particularly if it is marked by an objectionable quality or faulty articulation. The changes which follow loss of the teeth and absorption of the alveoli take most immediate effect upon the speech, though their influence upon the voice is sometimes remarkable, and in most instances quite noticeable. Voice may be briefly described as the motion imparted to the atmosphere by the passage of a column of air over the vocal cords while in a state of tension. Articulate speech is the result of certain impressions on this sound-wave produced by the tongue, lips, palate, teeth, pharynx, and the resonating cavities formed by the buccal walls. Loss of the teeth deprives the tongue of their support in articulation. It is followed by absorption of the alveolus, removing the support of the buccal walls and the lips, causing their contraction, and as a consequence a diminution of the size of the oral cavity, and

the obliteration of whatever of resonating space existed between them and the lost parts. Probably one-fourth of the whole vibrating surface involved in articulation is lost when the teeth are lost. Where but a few teeth are missing, and the loss is distributed through the arch, the case is not so difficult, and the principal points claiming attention are the choice of materials for retaining the teeth, and for the presentation of the minimum of obstruction to the action of the tongue. A metallic plate is of course the best, because combining the maximum of strength with the minimum of bulk, and gold is the best of the metals for the purpose. In the opinion of the writer there is but little choice between suction-plates and clasp-plates, provided proper care is taken in their construction, because, practically, the two styles offer nearly the same amount of obstruction. The latter, because it can be made smaller, has been usually regarded as having advantages over the former, but this idea has probably arisen from a lack of consideration of the proper methods of adapting the two forms. The sounds most affected by the presence of a foreign body covering the anterior portion of the palate, as when a plate is worn, are those produced in the formation of the letters J, T, D, N, S, L, R, and the combinations of S and H, T and H, and C and H; all of which are formed by the contact of the tongue with the teeth, and that portion of the palate forward of a line between the second bicuspids and first molars of the upper maxilla. Neither the suction- nor the clasp-plate will interfere much with the tongue if the edges are fitted perfectly, but in the case of the suction-plate the air-chamber must be properly placed. The most common mistake is to make the plates too small, thus necessitating the placing of the chamber where it will interfere most with the articulation. It should be placed near the center, and in all cases should conform to the general form of the roof, and be so shaped that it will present no abrupt projections to the tongue or to the sound-waves. So made, a suction-plate will be found very little more objectionable than a clasp-plate, and will present very little obstruction to a distinct articulation. When clasp-plates are used, the greatest care is needed to secure the relation between the plate and clasps that shall insure the firm retention of the piece in close contact with the portion of the palate covered by it. If the plate has a large surface, it should not be polished too highly, as this would increase the difficulty of articulation, first, by the formation of a vacuum between it and the tongue in certain positions, and second, by allowing the tip of the tongue to slip when it should be held firmly.

In the preparation of a denture for the full arch, there are many other considerations to be weighed, and in this view the introduction of plastic bases has widened the field of dental prosthetic art. The

best service is obtained from the metallic bases when combined with plastics, though when only the crowns of the natural teeth have been lost, or if treatment is begun before any changes have taken place in the alveoli or facial muscles, satisfactory results may be secured from the metallic base. The work of dental prosthesis should begin immediately upon the loss of the natural teeth; a denture should at once be made that shall fulfill every requirement in form, color, expression, and the best conservation of the functions of mastication and articulate speech, and upon this should be built whatever is needed to supply the loss of tissue consequent upon absorption. The custom of "preparing" mouths for artificial dentures as it is and has been practiced has done more injury than any other thing, and it is the prevalence of such methods that has placed this department on the plane it occupies to-day. The rules which govern the construction of partial plates are equally applicable to full sets. The air-chamber can be dispensed with in many cases, and whenever practicable this should be done, as it permits the construction of a plate of uniform thickness. The crowns of the teeth should be as long and as nearly the shape of the natural organs as possible; as clearly defined upon the palatal as upon the labial or buccal surfaces. The form of the sides of the arch should be adapted to the bearing of the tongue upon the bicuspids and molars, as the integrity of many sounds depends upon this condition. "Plumpers" will never be required if the true plan of prosthetic treatment is followed. If plastic bases are used, they should be carefully made of uniform thickness, and the edges should present the minimum of obstruction to a correct focus of sound. The benefit of following the method herein advocated, of beginning prosthetic treatment immediately after extraction, becomes apparent in this connection; for having once fixed the point at which the best result is secured for every consideration required, the necessary additions are made without prejudice to any of the important conditions, and the final adjustment is readily accomplished by a duplication of the original piece. But if absorption is allowed to go on for months or years, we may be justly blamed for ignorance or negligence, though we exercise the best judgment and the highest artistic skill in attempting restoration. The advancement of the operative branch of dentistry is based chiefly on prophylaxis, and whether we divide our specialty or not, the highest aim, the proudest achievement in our whole field of labor will be attained through adherence to this principle in our methods.

Dr. E. M. Flagg, New York, read a paper entitled "Mechanical Dentistry: Its Present Status, Prospects, and Possibilities," in which he said there had been a great advance in the construction and adap-

tation of artificial crowns to natural teeth, by the advent of the Bonwill and Richmond crowns. The prospect in this direction is flattering. In future, nearly all extensive operations now treated by gold-building may be performed in the laboratory, and afterward, at a short sitting, attached to the natural root. There is a better prospect for advancement in appliances for the correction of deformities, because of the increased interest awakened. In respect to the reduction of fractures and other accidents to the maxillæ, it now seems probable that the dentist will, in future, take entire charge of all such cases, owing to the perfection to which appliances for their treatment have been brought. In the construction and adaptation of artificial dentures, Dr. Flagg regretted his inability to chronicle the same advancement, but to him it seemed that the entire field of this work was covered by what he denounced as the "injun-rubber-gum-block" system. Thanks to the movement for the elevation of art in America, this department is receiving its share of attention, and intelligent persons are beginning to inquire why the teeth of young and old of both sexes look just alike, and why it should be so palpable that they are all artificial; so that the prospect is not bad for a reformation. When we, as dental artists, combine to exact a more thorough course of study on the subject, and compel students to analyze expression, character, and effect, as indicated in natural models, and attach the same importance to it, in its way, as we do now to the study of physiology, pathology, or anatomy; when an inharmonious expression is treated with the same severity as is a case of malpractice in other departments of our work, then, and not till then can we speak of the possibilities of artificial dentistry.

Dr. Mills's resolution regarding dental appointments in the army was adopted.

Adjourned.

(To be continued.)

NEW YORK ODONTOLOGICAL SOCIETY.

Regular meeting held at the residence of Dr. O. E. Hill, Tuesday evening, June 21, 1881.

President, Dr. W. A. Bronson, in the chair.

Incidents of Office Practice.

A letter from Dr. G. R. Thomas was read asking the opinion of members relative to the proper treatment of an undeveloped superior cuspid, the absence of which was shown by an accompanying cast.

Dr. John B. Rich. Under some circumstances, the difficulty of bringing down such a tooth might be very great. A case that oc-

curs to me now was one that presented some peculiar features and appeared formidable in view of the knowledge we had of such cases at that time. In this case, the treatment of which was commenced in 1850, the left superior cuspid had not appeared, although the gentlemen in whose jaw it occurred was then twenty-eight years of age. He was a finely-developed, strong, healthy man, who had never had any serious illness. The jaw was very large; the teeth were also large, well-developed, handsome organs of good structure, and not at all crowded, and there did not appear to be any reason why the tooth should not be in its place. The space that should have been occupied by the missing tooth was so large that it gave the mouth a very disagreeable appearance; still there was no prominence or other indication of the presence of the tooth, except that the gum and alveolus were full and did not exhibit any shrunken or contracted appearance. After repeated examinations, I came to the conclusion that there was a tooth there, and that it was a case of arrested eruption, and so advised the patient, and at his earnest solicitation I undertook the attempt to bring it down to its proper place in the arch. After removing a portion of the gum and alveolar process from the inside of the arch, I found the tooth, and in what I judged to be a normal condition. I shall now describe the apparatus I employed to move the tooth from the position in which I found it to where I wished it to be. For the first apparatus two gold caps were fitted to the crowns of the lateral incisor and first bicuspid, a box with a hinged cover was made of gold plate, of such dimensions that it would fit the space between those teeth and just clear the gum and allow the under teeth to articulate with the upper ones. This box was soldered to the caps so as to be retained in position; inside of this box there was fitted an elliptic spring made of part of a watch-spring of the full size that the box would hold; a gold wire passed freely through holes made in the bottom of the box (the part nearest the gum) and the center of the two parts of the elliptic spring. On the end of the wire designed to pass through the holes a thread was cut, and a small nut was fitted and placed on the outside of the half of the spring next to the cover. This nut was intended to compress the spring when the other end of the wire on which an eye had been formed should be attached to the tooth. This was done by boring and tapping a hole in the palatal surface of the tooth to be moved, and inserting a pin with the end turned up, forming a hook to which the eye of the wire already described was attached. When the spring was compressed the effect was to exert a downward pulling force upon the tooth, which gradually yielded to the power thus applied, and I had the satisfaction of knowing that it was actually coming down; but I watched the experiment in fear

and trembling, for at that time the profession had no knowledge of any such operation, and it was in every sense an experiment. My greatest fear was that I might destroy the vitality of the tooth, in which case there would have been no success that would have satisfied me. I judged that the danger to be apprehended was that the operation might be conducted with too much haste, and therefore my greatest anxiety was to so regulate the power I was using that the change in the position of the tooth should be as gradual as possible. Not that I had any doubt about the correctness of the theory I had formed in regard to the possibility of moving a tooth to its proper position under such circumstances; in this I did not waver for a moment, but the mode of doing it was the problem to be worked out, and it was about the detail of the effort that I was anxious. As the tooth came down, the end of the wire that passed through the nut was cut off, and when the point of the tooth was brought down so that it touched the bottom of the box, the apparatus was reconstructed so as to remove the bottom from the surface of the gum. This was done several times, and each time to the increased discomfort of the patient, as the apparatus protruded beyond the teeth, but as the ultimate success of the operation was by that time assured, and as the annoyance to him would soon terminate, I did not bother myself much about it, and he bore it with most commendable patience. The time occupied from the commencement to the completion of this operation was over two years.

I desire to direct attention to the use of the elliptic spring in cases like that just described. In my opinion it is superior to any other means that we have at our command for applying continuously operating power to move the teeth. No other spring can be so delicately and certainly graduated as the elliptic, and when circumstances render its use possible no other can be employed to so great advantage. It is easily constructed and adapted, and those who use it for the first time will be surprised to find how small a one will give all the power required.

In addition to the pulling power exerted by the spring, percussion was applied to the gum and all the parts surrounding the tooth to be moved. This I regard as an important auxiliary in producing development, and in cases of contracted or imperfect development of the jaws I have used it with marked success. The most convenient instrument for this purpose is a mallet made of a solid India rubber ball of about one inch and a half in diameter, with a handle inserted into it. The blows with this instrument must be very light and continued for at least thirty minutes at a time, several times each day—six or eight times if possible—but they must not be hard enough to bruise the parts, but just heavy enough to

produce a very slight sensation, so that there may be an increase of the circulation without producing congestion, and these blows must not be made too rapidly. Time enough ought to be allowed between them for the part that receives them to partly recover from one before the next is struck; the blows should be spread over a large surface so that there may be a general irritation of the parts around the point to be developed; but this treatment and all other attempts to assist nature should be employed with the greatest care.

Dr. Wm. Jarvie, Jr. I do not think this is an unusual case of arrested development of a tooth. I have seen quite a number in the mouths of patients varying from 19 to 30 years of age. I have never attempted to do anything to hasten the development of these teeth except in a case where a tooth was situated on the outside of the arch. This was in the mouth of a young lady, 23 years of age. In this case I cut through the gum and process, drilled into the crown of the tooth, and inserted a screw to which I attached a rubber band. By this means I brought the tooth down to its place with no bad results, the pulp retaining its vitality.

Dr. Milis. I had a case in my hands a year ago last spring which had some similarity to the one shown here. The tooth in this case—a superior cuspid—was partially erupted, the point being through the gum. The lateral incisor and central stood close together, and the bicuspids were in their places. The lady was 40 years of age. On March 29, a year ago, a fixture was applied, and in the month of September it was taken off, the tooth being in place.

Dr. Dwinelle. This reminds me of the cases I reported some time ago. The first was that of a gentlemen who had worn a full upper set for fifteen or twenty years, and who was finally attacked by neuralgia in its worst form. It baffled every attempt at diagnosis on the part of physicians whom he consulted. His sufferings were excruciating. He was brought to me by Dr. Lord, and fortunately I was able to diagnose it at once—I hardly know how—I suppose by intuition. I found a large protuberance across the center of the palatal arch and I immediately decided that an undeveloped tooth was located there. Evidently that was the cause of his sufferings. He was very unwilling to be looked at or even to be touched, but finally accepted my diagnosis. He submitted to the operation and I removed the tooth and relieved him. He had been suffering for weeks and he told me he had not slept for seven days and seven nights, which was probable.

The other case was that of Mrs. Judge M—, of Washington. She had been condemned to die of "bone cancer." There was a protuberance in the palatal arch similar to the one just mentioned. In the center of this protuberance the bone was denuded and ex-

posed, and having been treated with nitrate of silver it presented a forbidding appearance. I succeeded in breaking off a piece from this protuberance; and putting it under the microscope, the enamel rods exposed themselves. The deduction was enamel; of course enamel meant tooth, and then the diagnosis was plain. I dissected it out. She rapidly recovered, and twenty years afterward died of old age.

The suggestion that Dr. Rich made with regard to percussion seems to me a very good one. It is one that nature herself points out. Even mothers find themselves instinctively manipulating the gums of their children during the process of teething. The child is constantly doing it by putting anything that it can get in the mouth and biting with severity almost. In a paroxysm of pain the child will catch up a hard substance and bite until the gums bleed. The matter of manipulating the gums has been nature's teaching ever since civilization began. Before sitting down, and under the pain of repeating myself too often, I will refer to a case that I have mentioned before, where two tardy eye-teeth were developed in a patient eighteen years of age. They had just crept out, showing their points, and there they remained for years, refusing to proceed further. I moved the teeth back between the first bicuspid and lateral, and got a space there, and then slipped a piece of floss up as far as possible on the necks of the teeth, and worked it up constantly and gradually with burnishers until I got it above the convexity of the teeth. I then tied it to its place, and slipped on little rubber rings. These rings were stretched and caught over hooks of gold, which were attached to a plate which covered the palatal arch. By this means the teeth were drawn down to their proper place. The problem was to draw them down while the roots were growing, and yet not destroy the pulps. The operation was an entire success. I think I once exhibited the casts of the case to this society. In the case shown here to-night I think that the tooth can be developed and brought down to its proper place.

Dr. Rich. I have had several agreeable experiences recently in the treatment of extraordinary sensitiveness of the roof of the mouth, and although I have previously stated my mode of treating such conditions, I deem it of sufficient importance to say a few words in relation to it this evening. A lady came under my treatment who, from the extreme sensitiveness of the back part of the roof of the mouth, had never been able to have the rubber dam applied to the back teeth. A cavity having been discovered in the distal surface of the left second superior molar, her family dentist endeavored to apply the rubber dam to excavate the cavity, but after a long and patient effort he was obliged to abandon the attempt. The

effort to apply the dam was repeated by him several times, but without success. Under these circumstances she applied to several eminent men in our profession with a like result, and the matter became a subject of anxiety to her and began to affect her health and spirits. A friend of hers brought her to me, and I attempted to make an examination of the tooth, but the extraordinary sensitiveness of the parts around the tooth had been so much increased by her nervous condition that no matter how careful I tried to be I could not apply a piece of paper between the teeth, without producing the most violent retching and gagging, which continued for several minutes, and which left her exhausted and entirely prostrated for some time after the choking sensation had ceased. It was altogether the worst case of this kind I had seen. When she recovered I told her that a few inhalations of nitrous oxide gas would remedy the difficulty she was laboring under, and that I had seen several cases similar to hers that had been successfully treated with nitrous oxide. As she was very much prejudiced against the employment of anything of that kind, she left without testing the efficacy of the treatment I had proposed. But she returned in a few days and said she had made up her mind to submit to the course I had recommended. I administered two or three inhalations of nitrous oxide and examined the cavity without any trouble, and by repeating the inhalations I was enabled to prepare the cavity, apply the rubber dam, and introduce and finish the filling. There was no trouble during any part of the operation. Whenever she evinced any disposition to gag I administered one or two inhalations of the gas and the trouble ceased at once, and the whole work went on without any excitement. I have filled several cavities in her upper back teeth since then—one a few days since—and the nitrous oxide renders the performance of such operations free from difficulty. It also renders the taking of impressions quite easy where there is great sensitiveness of the roof of the mouth.

Another case that came under my observation a short time since has also some interest. One of my patients, the sister of a physician, experienced considerable difficulty on account of an elongated palate. The annoyance became so great that her physician resolved to cut a portion of it off, but every attempt that was made to keep her quiet long enough to accomplish this had so far been a failure, on account of the enlargement and extreme sensitiveness of the palate and surrounding parts. Her physician, who was also a patient of mine, mentioned this to me one day and I suggested the use of small quantities of nitrous oxide, and offered to administer it if he would bring the patient to my office. He brought her the next day. She took but two inhalations of the nitrous oxide, and he re-

moved what he wanted to of the elongated palate and she did not make the slightest movement while he was doing it. He was astounded at the effect produced by so small a quantity of the gas and by the fact that the patient was not at all in a condition of anesthesia. In all such cases the nitrous oxide becomes a very valuable auxiliary.

I use it also for the purpose of obtunding sensitive dentine while I am working upon it, whenever there is occasion to do so. In fact, I have used either ether or nitrous oxide for that purpose ever since the first introduction of ether to the profession by Dr. Morton. In a conversation with him on the occasion of his first call upon me in regard to employing ether as an anesthetic, I said to him that if it possessed the properties he claimed for it might it not be used in small quantities to obtund the pain caused by working upon sensitive dentine. He replied that he did not think any desirable result could be produced, except the patient was in a condition of complete anesthesia. I did not pursue the argument any further with him, but the next day, on his invitation, I attended a clinic where the patients were operated upon while under the influence of this new agent. After a careful observation of the effects produced there I formed the conclusion that if the administration of a certain quantity of a substance by inhalation would produce complete anesthesia, and an entire obtunding of the nerves of sensation, then the administration of a much smaller quantity would, without producing unconsciousness, obtund the nerves of sensation sufficiently to allow of dentine that was sensitive being worked upon without producing pain. Some experiments that I instituted immediately afterwards proved that I was correct in my deduction. For several years past I have used nitrous oxide exclusively for this purpose, and with marked success. A very small portion only is necessary to produce the desired result—two or three inhalations are generally all that is required. I have many patients who will not allow me to touch sensitive dentine without the use of nitrous oxide. It is not at all troublesome to use, as my method is to fill the bag, which holds about four gallons, and hang it to the arm of the chair, with the case containing the cylinder of gas standing right under it. There I can reach the valve easily when I wish to replenish the bag. The first time it is inhaled at each sitting I hold the inhaler myself, and the patient closes the nostrils, but after the first inhalation the patient takes the inhaler and applies it to the mouth, of course under my direction, and makes the inhalation without closing the nostrils. It will be astonishing to those who are not accustomed to its use to know how little will answer each time it becomes necessary to renew the effect, and you can cut almost as rapidly as you may wish. When the effect begins to wear

off the patient will call out: "Stop, I begin to feel it," and you direct him to take a breath of the gas. He does so, and generally one good inhalation will be enough, and you can go on with your work, for it works like a charm.

Dr. A. H. Brockway. I have never been in the habit of using nitrous oxide in such cases, but I occasionally use chloroform, and have always employed it in my own case when I was the patient rather than the operator, and with excellent effects. I should like to ask the cause of and the best treatment for that excessive sensitiveness that sometimes occurs at the necks of the teeth?

Dr. Frank Abbott. In the first place it is very well known I think among those who have examined the teeth carefully under the microscope, that there is more living matter around the necks of the teeth, in that particular locality where the gum is attached, than any other portion of the tooth. When the gum recedes from the neck and exposes it to the acids of the mouth, a slight portion of the lime-salts is dissolved away, and the living matter becomes inflamed. In my opinion that is what causes it, and I think there is no question about it, because with a little bicarbonate of soda you can neutralize the acid and take away the sensitiveness.

Dr. Dwinelle. You can dispose of it permanently by using chloride of zinc. I generally apply the rubber dam, so as not to let the preparation get up so far as to destroy the periosteum at the point of the festoon of the gums. I then apply chloride of zinc and accelerate its action by a heated instrument adapted for the purpose. I heat the instrument in a lamp and apply it, roasting it in. With careful manipulation you can remove all of the pain, and remove it permanently, so that you can even cut into the sensitive portion with impunity. I have had patients come to me whose teeth were so sensitive at their necks that drawing of the breath in the mouth would produce a shock that almost prostrated them. I removed the whole in a very short time, and removed it permanently. If you do not carry the effect far enough it will come back, but by careful and thorough manipulation you can remove the sensitiveness permanently.

Dr. Rich. While the subject of sensitive dentine is under consideration I will describe the method I employ when the teeth have worn down on their grinding surfaces, and the exposed dentine has become painful during mastication, or when the teeth are brought together. In such cases I apply the actual cautery to the sensitive parts. A very thin film only of the dentine will have its vitality destroyed by the application of the hot instrument, and this portion at once becomes a bad conductor of heat and the devitalization is arrested, but the painful sensitiveness will, in most cases, be entirely removed. The sensitiveness of any exposed dentine may be alle-

viated in this way, provided the instrument can be applied to the sensitive part as near a white heat as possible. The cauterizing instrument I use for sensitive dentine is made of copper, weighs about an ounce, and is the shape of a Guinea-hen's egg. The whole of the surface is made rough with the square edge of a coarse bastard file; the handle is attached to one of the sides by drilling and tapping a hole of No. 25 Stubbs's gauge, in the center of the side at right angles to the longest axis of the bulb, and screwing tightly into it a piece of soft iron wire on which a corresponding thread has been cut. The other end of the wire is inserted into a wooden handpiece of a diameter large enough to enable the instrument to be held firmly, the whole forming a handle not more than six inches long.

Since I mentioned at one of the meetings of this society that I use absolute alcohol to render cavities dry previous to filling them, I have been repeatedly asked to describe how it is to be applied to produce that result. The use of absolute alcohol for that purpose is indicated by one of its properties, which is that if it is brought in contact with any porous or cellular substance, such as wood or bone, whose pores or cells contain water, the alcohol will drive out and take the place of the water that was contained in those cells; then when the water that had been ejected from the cells has been absorbed by paper packed into the main cavity, the absolute alcohol being very volatile evaporates quickly, leaving the cells empty and the porous substance dry.

The mode of applying it to the drying of cavities is very simple. After the cavity is prepared for the filling and washed out with a jet of water, make it as dry as possible with paper; then with a pipette or drop-tube fill it with absolute alcohol, and leave that in until the moment the filling is to be introduced; then absorb the alcohol with bibulous paper, apply the air jet to the cavity, and fill as soon as possible, as substances dried in this manner absorb moisture from the air that comes in contact with them very rapidly.

Adjourned.

PENNSYLVANIA ASSOCIATION OF DENTAL SURGEONS.

REPORTED BY THEODORE F. CHUPEIN.

A meeting of the Pennsylvania Association of Dental Surgeons was held Tuesday evening, October 11, 1881, Dr. J. H. Githens, president, in the chair.

By request, Dr. Buckingham made a synopsis of the proceedings of the national associations which met in New York. He alluded especially to the paper read by Dr. J. B. Patrick before the National association, entitled "Singular Exhibition of Interstitial Growth in Teeth." (See Dental Cosmos, October, 1881, page 534.)

Dr. Chupein said he was intimately acquainted with Dr. Patrick, as well as with Captain Blake, the patient, and that he had been furnished with a cast of the two front teeth of the latter, taken by Dr. Patrick after the expulsion of the filling.

The case was commented on by those present, but with evident disinclination to accept the conclusions of Dr. Patrick, though Dr. Chupein stated that a somewhat analogous case had been reported by Professor Garretson at a meeting of the Odontographic Society of Pennsylvania.

Dr. E. H. Neall, the essayist of the evening, read a paper entitled "Review of the Causes of the Decay of Mechanical Dentistry." He attributed this to the advance made in operative dentistry, the more intelligent appreciation of the natural teeth by nearly all classes, and the better instruction given by the dental colleges to students, the greater number of natural teeth saved by better work done, etc.

Dr. Buckingham differed with the essayist as to the causes of the decline of mechanical dentistry. He felt sure that more teeth were inserted now than ever before. Many dentists discarded mechanical dentistry because operative dentistry was more pleasant to pursue. Manufacturers state that they make and sell more artificial teeth than at any former period. It is only lately that a leading dentist of the West offered a resolution at one of the dental societies recommending striking out the instruction on mechanical dentistry from the curriculum of the Dental Department of the University of Michigan. Indeed, some were disposed to sneer at the dentist who practiced mechanical dentistry. He attributed its decay—if it has decayed at all, which he does not admit—to the hands into which mechanical dentistry has fallen. Many operators do not perform laboratory work, as formerly, but simply take the impression and the bite and send these to some laboratory for completion. The workmen know nothing of the characteristics of the patient and their only guide is the size and shade of the teeth required. Thus patients are furnished with artificial teeth by these dentists in the same style as by the mere charlatans in dentistry, the only difference being in the price charged. If mechanical dentistry were made distinct from operative dentistry and men of culture, taste, skill, and discrimination would engage in it, then patients would be well served if disposed to pay well for the service. There must always be a demand for artificial teeth. He thought the rubber base and sectional teeth were also causes of the decline of mechanical dentistry. Operative dentistry would decline too, if teeth could be filled with gold as easily as a set of teeth could be mounted on rubber. Wherever a method is cheapened or simplified to such an extent that

any one can practice it, decline is sure to follow. He regarded celluloid as the best material yet brought to the notice of the profession for artificial teeth. It was easily repaired, pleasant to work, a good imitation of the natural gum, light, tough and strong. The parts lost by absorption were easily replaced; the irregularities of the natural denture were nicely reproduced with it. Many dentists condemned it, but he thought they did not understand the material. He thought a gold plate with a rim on the inside and outside and celluloid attachments was, when skillfully constructed and discriminately mounted, as fine work as could be furnished. He referred to a dentist who wore a set of artificial teeth mounted in the continuous-gum style, and he supposed from the size of the plate and the amount of material necessary to make the "plumpers" that the case must have weighed well-nigh a pound. The same case mounted on celluloid would not weigh over two ounces. All this style of work required taste, skill, and judgment, and of course if it is allowed to fall into the hands of men who have not these requirements we cannot expect anything else but imperfect work. If intelligent men would take hold of it, it would pay quite as well as operative dentistry and be quite as respectable. The filling of teeth is a mechanical operation as much as the mounting of a set of artificial teeth—only one is done in the mouth, the other out of the mouth—but as much skill is necessary for the one as for the other.

Dr. W. H. Trueman would ask the question, "*Has* mechanical dentistry declined?" The samples of carving exhibited by the essayist show no decline; nor is the gold case a sample of decline of mechanical dentistry. When we compare the discomfort of the old "horseshoe" form of plate, retained in place by spiral springs rubbing against and irritating the cheek, we see rather an advance in the invention of the central air-chamber for the retention of artificial teeth even in the well-fitting rubber or celluloid plate of to-day. Despite the best operative dentistry the natural teeth will be lost. This sometimes occurs from recession of the gums and the absorption of the alveolar processes, demanding the removal of the teeth from excessive looseness. Sometimes, through fear of dental operations by nervous patients, all the teeth are suffered to decay to such an extent that filling becomes useless. These losses must be supplied, and it behooves the dentist to supply them in the best and most skillful manner. He felt sure that to construct a set of teeth, such as was exhibited by the essayist, was quite as difficult an operation as to fill a tooth.

Dr. W. F. Litch said it was impossible to divorce mechanical from operative dentistry. Mechanical dentistry must be in the hands of the dentist, and ever will be. Suppose some teeth were

lost, those that remained had all the work of mastication to perform. This extra work would sooner or later result in the loss of those remaining teeth. Must this loss be permitted because dentists did not wish to do mechanical work when the supply of the teeth needed would not only save those that were left but assist them in the process of mastication? He spoke of the difficulties of carving teeth, of the softness of the material to be carved, and of the fine lines given to the carving being often obliterated in the burning or in the application of the enamel. The molds of the block teeth were often beautiful, but the teeth from these molds were never an exact reproduction of them. He thought a reliable base for artificial teeth was needed. Is there less demand for the services of the mechanical dentist now than in former years? He thought not. Many persons could not be persuaded to have their natural teeth saved. This was partly due to the fear of dental operations, possibly to bungling, unskillful operations which had been submitted to in the hope of saving their natural teeth, and an unwillingness to endure the same experience again. People were indisposed to suffer the least discomfort to have their own teeth preserved—and the knowledge they had that they could get rid of their own painlessly by means of anesthetics and then get in artificial ones was one of the causes of the loss of the natural teeth and the demand for artificial ones. Consequently he did not think there was a decline in mechanical dentistry as far as the demand for artificial work was concerned. From the cheapness of the work, unskillful work was turned off, which made men of discrimination revolt against it. He thought if the poorer classes were not driven away by the high prices charged for operative dentistry, more of the natural teeth would be saved. He recommended the use of tin foil in such cases, and the education of the public as to the superior value of their own teeth over artificial ones.

Dr. Buckingham thought there was a wide field open to those who had the taste and talent to pursue mechanical dentistry exclusively. But taste, appreciation, and skill were required. With proper efforts and the direction of skill, mechanical dentistry can be placed on a higher level than ever before, because we have more resources to draw from.

Dr. Adams presented some questions for the consideration of the meeting:

First.—Is a dentist liable to prosecution if he prescribes or administers medicines to his patients without a medical diploma?

Second.—Must dentists have their diplomas registered?

The secretary read from page 65, Pamphlet Laws of Pennsylvania for 1881, the section bearing on this point.

Drs. Litch and Buckingham thought dentists liable to prosecution for prescribing or administering medicines for a fee, yet they believed the law was in this matter intended to prevent empiricism rather than to interfere with any graduate of a dental or pharmaceutical college.

Officers were elected as follows:

President.—J. H. Githens.

Vice-President.—Spencer Roberts.

Recording Secretary.—
Corresponding Secretary.—
Reporter.— } Theodore F. Chupein.

Treasurer.—
Librarian.— } W. H. Trueman.

Committee on Membership.—T. L. Buckingham, Amos Wert, and E. H. Neall.

MASSACHUSETTS DENTAL SOCIETY.

The seventeenth annual meeting of the Massachusetts Dental Society was held in Boston, December 8 and 9, 1881, the President, Dr. G. F. Waters, in the chair.

The committee to petition the Legislature for a law regulating the practice of dentistry in the State reported progress and was continued.

The following officers were elected for 1882:

President.—D. B. Ingalls, Clinton.

First Vice-President.—A. B. Jewell, Newton.

Second Vice-President.—D. M. Clapp, Boston.

Secretary.—W. E. Page, Boston.

Treasurer.—Edward Page, Charlestown.

Librarian.—R. R. Andrews, Cambridge.

Executive Committee.—Drs. E. B. Hitchcock, D. F. Whitten, Leon Rideout, F. M. Robinson, F. E. Banfield.

W. E. Page, D.M.D., *Secretary.*

OHIO STATE DENTAL SOCIETY.

At the sixteenth annual meeting of the Ohio State Dental Society, held in Columbus, December 7, 8 and 9, 1881, the following officers were elected:

President.—A. F. Emminger, Columbus.

Vice-President.—J. W. Lyder, Akron.

Secretary.—W. H. Sillito, Xenia.

Treasurer.—G. W. Keely, Oxford.

W. H. Sillito, *Secretary.*

EDITORIAL.

THE NEW ZEALAND DENTAL ACT.

The dental act which was passed by the New Zealand Parliament and which took effect from and after the first day of June, 1881, provides for the registration of dentists qualified to practice in that country.

The qualifications for registration are, both for colonial and foreign dentists, that they shall show that they are of good moral character and shall have been at the time of the passage of the act *bonâ fide* engaged in the practice of dentistry or dental surgery, either separately or in conjunction with the practice of medicine, surgery, or pharmacy; or that they shall show that they hold some such recognized certificate, diploma, membership, degree, license, letters, testimonial, or other title, status, or document, as may be recognized by the Board of Examiners (consisting of six persons appointed by the Senate of the University of New Zealand) as entitling the holder thereof to practice dentistry or dental surgery in that colony, and as furnishing sufficient guarantee of the possession of the requisite knowledge and skill for the efficient practice of dentistry or dental surgery. A fine of twenty pounds is imposed upon those practicing without registration, and it is provided that they shall not be entitled to recover in any court fee or charge for the performance of any dental operation.

The act provides for an appeal from the Board of Examiners, when they have decided adversely to the claims of an applicant for registration, to the Governor in Council, who may, upon sufficient evidence, order the board to recognize the certificate or qualification of the applicant.

A penalty of imprisonment for a term not exceeding twelve months is imposed upon any person who willfully procures or attempts to procure registration under the act by false or fraudulent representation.

GRATUITOUS DENTISTRY IN THE SCHOOLS OF PARIS.

We have received from Dr. E. Taillebois, of Paris, a copy of the petition of himself and nine colleagues, addressed to the Municipal Council of Paris, with reference to the performance of gratuitous dental service by themselves and assistants in the primary public schools in that city. Their offer has been accepted by the Council, and the scheme has been put in operation. The regulations provide for a semi-annual examination of the mouths of all the children in these schools whose parents have signified their willingness that

it shall be done, and the performance of such operations as may be deemed necessary. Dr. Taillebois is sanguine as to the good to be thus accomplished for the children and believes that such early training will result in securing better attention to the teeth throughout life by those that are thus cared for in childhood. He hopes to see a similar plan carried out in all the large cities of France, as well as throughout Europe.

BIBLIOGRAPHICAL.

Notes on Dental Metallurgy for use of Students. By S. R. Wing, D.D.S. Philadelphia: J. K. Hanes, 1881.

This little pamphlet of twenty-four pages of notes or headings would under the most favorable conditions be too meager for the purpose of instruction. It however contains many inaccuracies, plainly due to a want of familiarity with the subject. Thus "The sixty-four known elements are divided into two classes—metals and metalloids." In the table of metals no mention is made of davium, a metal of the platinum group, discovered by Kern in 1877. Mercury is given as "an element in amalgams for filling teeth." As, strictly speaking, we can have no amalgam without mercury, it would have been correct to state that mercury is the amalgamating element in dental alloys. Mercuric sulphide or vermilion is referred to as "occurring native as cinnabar." Vermilion never occurs native; it is the artificially formed sulphide, while cinnabar is the native sulphide. The dry and humid formulæ for the preparation of purple of Cassius (pages 14 and 15) are both utterly incorrect, and that material could not possibly be made by either process described. It would have been a satisfaction to know whence the methods were derived. No credit, however, is anywhere given in the pamphlet to the authorities quoted. The pamphlet seems to have been compiled for the purpose of coaching students, in which capacity it could hardly be expected to accomplish much good; but under any circumstances it would not be unreasonable to expect in a work designed for the use of students at least correctness in its data.

C. J. E.

The Opium Habit and Alcoholism. By Dr. F. H. Hubbard. New York: A. S. Barnes & Co., 1881.

In this essay Dr. Hubbard has undertaken to present to the profession and to the community at large a subject which is undoubtedly of increasing importance. He gives a description of the effects of opium, alcohol and chloral, bromide of potassium, etc., when taken

habitually and in excess; relates numerous cases which have come under his notice, and details the line of treatment which he adopted.

The book is written in a diffuse, highly imaginative, and unscientific style; filled with elementary recipes in large type and bad Latin, and probably contains more mistakes—rhetorical, grammatical, and orthographical—than any other book of its size in the language. It is without table of contents or index, and the typography and general appearance of the book are about on a level with its intrinsic merit.

OBITUARY.

DANIEL HARWOOD, M.D.

Died, at Dorchester, Mass., October 2, 1881, Dr. Daniel Harwood, in the eighty-first year of his age.

Dr. Harwood was born in Barre, Mass., March 21, 1801. He attended the academy at Leicester for some time, when his studies were interrupted by illness, and were never again resumed there. Meantime he had determined to make the profession and practice of medicine his study and effort. After fitting himself by the proper studies and attendance upon lectures, he commenced practice in Northampton, Mass. Afterward he entered the medical school at Brunswick College, where he graduated.

He embraced the specialty of dentistry, and settled in Portland, Me., associating himself with Dr. Prentiss, then one of the finest operators in the profession. About 1829 he removed to Boston, and located permanently. He soon invited Dr. Lane, a fine practitioner, to join him professionally, which connection only terminated with the death of Dr. Lane. Soon after this he associated with himself Dr. Joshua Tucker, whose obituary appeared in our December number. This connection lasted till Dr. Harwood's health broke down in 1840.

Having become interested in mill property in Eastern Maine, with the object of regaining his health he spent some six years in that business, at the same time practicing medicine with much success. Having finally succeeded in restoring his health, he returned to Boston and again entered the practice of his profession. He soon secured a practice far beyond his personal ability to attend to, and is conceded to have reached the highest professional standing. After the great fire in Boston, in 1873, he gradually retired from the active duties of his profession, and for the last five or six years has given no time to it. He moved into Dorchester in 1855, while it was yet a town.

At the annual meeting of the American Academy of Dental Science, Boston, of which Dr. Harwood was formerly president, resolutions were unanimously passed expressive of the society's estimate of his moral worth and professional character; his energy, talent, courage, and fidelity, and in recognition of the fact that he was one of the first in this country to take a high stand in the practice of his profession.

The marked characteristics of Dr. Harwood were energy of purpose, indomitable perseverance, and strict integrity. The peculiar cast of his mind was to investigate. He was strong in his likes and dislikes, was tolerant of the opinions of others, but persistent in maintaining his own. He was exceptionally retiring and modest in his nature, being almost morbidly averse to parading his own merit or directing attention to himself for his own advantage.

R. SHELTON MACKENZIE, M.D., LL.D., D.C.L.

Died, at his residence in West Philadelphia, on November 21, 1881, Dr. R. SHELTON MACKENZIE, in the seventy-third year of his age.

DR. MACKENZIE was for many years secretary of the Board of Trustees of the Philadelphia Dental College.

Mr. CHARLES ABBEY.

Died, December 28, 1881, Mr. CHARLES ABBEY, in the eighty-fourth year ot his age.

Among those whose interest as manufacturers has been identified with the dental profession, none have been longer or more widely known than Mr. Abbey. Born March 6, 1798, at East Hartford, Connecticut, he was indentured to Marcus Bull, gold leaf manufacturer, at the age of thirteen, nearly three-quarters of a century ago. He has seen the rise and progress of dentistry, and is entitled to no small credit for his successes in meeting the needs of dental practice as they were developed. In 1817 Mr. Bull removed his manufactory, with his workmen and apprentices, to Philadelphia. Shortly after attaining his freedom, Mr. Abbey was made manager of the business; retaining that position until, in 1835, he became a partner with Mr. Bull. At this time the manufacture of gold leaf was discontinued, and thenceforward the sole business was the manufacture of gold foil. In 1839 Mr. Bull's interest ceased, and the business was continued by Mr. Abbey until 1847, when, by the admission of his eldest son, the firm became Charles Abbey & Son. In 1878 Mr. Abbey withdrew his pecuniary interest, having ceased from active connection some fifteen years previous.

Mr. Abbey was a man of sterling integrity, and commanded the confidence of all who knew him.

PUBLISHER'S NOTICE.

TO OUR SUBSCRIBERS.

We believe the twelve numbers of the Dental Cosmos issued during the year just closed make up the finest volume published in the course of its existence—a conclusion shared by many of our readers. We have endeavored to make its pages representative of the widening field of dentistry. It gratifies us to know that our efforts are appreciated. That the influence of the journal is increasing is evinced not only by its constantly increasing circulation in this country, but by the large and growing demand for it in foreign countries. Dentistry is among the arts progressive and progressing, and it is our ambition to reflect whatever is of value in the progress. This, the initial number of the new volume, cannot, we think, fail to be received with pleasure and read with profit even by the most advanced in the profession.

As announced in our last issue, we have abandoned the practice of seeking subscriptions by the offer of a premium. The journal is worth the subscription price or it is not; the profession must judge it by its merits.

We invite contributions to its departments of original communications, hints and queries, and reports of societies. We want, however, the kernel without the shell—only that which is of *practical* value to the dentist wherever located. Routine business, reports of suppers, names of speakers, and titles of papers read, make dreary reading. Our space can be much better occupied.

With the compliments of the season to former patrons, and to the profession at large, we invite prompt subscriptions and renewals, trusting to make the current volume worth all it costs to any practitioner of dentistry.

The S. S. White Dental Manufacturing Co.

PERISCOPE.

PRIMARY TUBERCULOSIS OF THE PALATE.—Dr. B. Küssner (*Deutsche Med. Wochens.; Cbl. f. Chir.*, 1881, p. 457) brings forward five cases of primary tuberculosis of the palate and pharynx. The first of these cases terminated in a very probable cure; the second in a certain cure; the third endured and even increased in size slightly for a long time, then remained stationary, the patient finally dying of tuberculosis of the lung; the fourth was accompanied by a rapidly-developing miliary tuberculosis; the fifth, by tuberculosis of the lung, larynx, etc. It is thus seen that all of these ulcers are not progressive; but the suspicion of possible syphilis should be completely set at rest in future reports. Küssner thinks it likely that among the so-called scrofulous, easily curable ulcers of the mouth and pharynx found in children, many are in reality tuberculous in character.

Palliative treatment is possible in the earlier stages. Küssner recommends active cauterization with nitrate of silver or Paquelin's cautery. A five-per-cent. carbolic acid solution is useful as a local anesthetic.—*Philadelphia Medical Times.*

APHTHOUS SORE MOUTH OF INFANTS.—Prof. Wallace believes that the sodium sulphite solution is the best remedy for aphthous sore mouth in infants.

℞. Sodii sulphit., gr. xxx.
Glycerini, }
Aquæ, } āā ℥ ss M.

To be used on a swab every two hours. Where the child is using a nursing bottle, scrupulous cleanliness is required. The rubber nipple should be turned inside out after each time of using, washed clean, and placed in a solution of bicarbonate of sodium (baking soda) in a tumbler, until again needed. It is better to have two, and use them alternately. Milk must never be allowed to stand in the nursing bottle until it becomes sour.—*College and Clinical Record.*

EXSECTION OF THE INFERIOR MAXILLARY NERVE.—At the Hospital of Oral Surgery a new operation for exsection of the inferior maxillary nerve in the spheno-maxillary fossa was practiced by Prof. Garretson at his clinic, November 19, in a manner which, in the ease and certainty of the performance, places the matter in an entirely new position and converts complexity into simplicity.

After making the required trapway by dissecting the masseter muscle from its attachment to the ramus of the lower jaw, a cylindrical drill half an inch in length and the same in diameter was inserted into the mandrel of a powerful surgical engine; and, by it in revolution to the extent of five thousand times in a minute, the nerve was quickly laid bare to its place of entrance into the bone at the posterior dental foramen. Next, the opening being enlarged until the pterygoid muscle was fairly exposed to view, the nerve was cut at the site of its inferior exposure, and, being lifted from its bed and held on the stretch, the handle of a scalpel was made to isolate it up to the point of emergence at the base of the skull. It was there excised, a pair of delicate iris scissors being used.

The ease with which this most complex operation is performed after the manner described requires to be seen to be appreciated. The impression produced on the large number of students and medical gentlemen present was marked. It will surely divest the operation of the fear and hesitation always felt by the surgeon undertaking it.—*Philadelphia Medical Times.*

Operation for Necrosis of Lower Jaw.—Kate K., aged 13, an exceedingly weak, unhealthy looking girl, was admitted into the Meath Hospital on October 12 suffering from necrosis of the lower jaw, extending nearly from symphisis to angle. *History.*—For nearly three years she has been suffering from abscesses continually forming along the lower jaw, and when formed they usually opened, leaving unhealthy sinuses behind which discharged a thin kind of ichorous pus. On examination it was found that a large piece of the bone was quite bare and loose.

Operation performed for Sequestrotomy.—An incision was made along the ramus of the jaw uniting the sinuses, and with the aid of the necrosis forceps, bone forceps, and elevator, a large portion of the dead bone was successfully removed from the outside. The mouth was now opened and it was found that there was some more necrosed bone still remaining, which was loose to a certain extent, and to which were attached two of the molar teeth. After a good deal of gentle manipulation this further portion was removed through the mouth. A profuse hemorrhage followed. This was arrested by plugging the wound, which was considerable in size, with lint. The girl made a good recovery, and was discharged from the hospital in a fortnight.—*Clinical Records of Meath Hospital, in Med. Press and Circular.*

Sarcoma of Upper Jaw.—Mr. C. Macnamara exhibited a patient from whom he had removed a sarcomatous tumor of the upper jaw, and read notes of the case. The patient, a married woman, aged fifty-one, was admitted into the Westminster Hospital on January 29. She had first noticed a swelling of the right upper jaw about fourteen months before; at first it caused little inconvenience, but, during the last three months, she had suffered severely from neuralgic pain in the right side of the face. The tumor occupied the maxillary process of the right superior maxillary bone; it did not extend back to the soft palate nor project into the nasal or orbital fossæ, and there was no enlargement of the neighboring lymphatic glands. On February 5, Mr. Macnamara removed it by making an incision through the upper lip, along the right ala nasi, and across the cheek to the malar bone; the alveolar process was then divided to the right of the symphysis with a Hey's saw, together with the nasal process of the superior maxilla and the malar bone, completing the separation of the tumor with bone forceps. The patient made a rapid recovery. Mr. Macnamara showed a cast, taken by Dr. Walker before the operation, and also some sections of the tumor, which proved to be an osteo-sarcoma under the microscope. Mr. Butlin called attention to the presence, in these sections, of some small rounded or oval bodies, composed of calcareous matter; they were homogeneous, highly refractive, and marked with

slight parallel lines concentrically arranged. So far as he was aware, these bodies had only been observed in three other cases; these were all tumors of the lower jaw, and all occurred in young subjects. Mr. Charles Tomes had noticed the small calcareous bodies spoken of by Mr. Butlin on at least two previous occasions in tumors in the mouth, and was not aware of their great rarity. One was a case of great hypertrophy of the gums, and the other was an ordinary fibroid epulis. He was much struck with their close resemblance to the bodies called calco-spherites, which were apt to form whenever salts of lime were precipitated in presence of organic matter.—*Reports Odontological Society of Great Britain, in British Medical Journal.*

Removal of Large Odontome from the Lower Jaw.—This was one of the rare tumors described by Broca as *odontomes odonto-plastiques* and consisted of a mass of dentine studded with nodules of enamel. The mass weighed 315 grains, and measured 1½ by 1¼ inches. The patient was a young lady of 18 who had never been able to close the teeth properly, but otherwise was supposed to have gone through the first and second dentitions naturally. Last Christmas, she had some pain and uneasiness about the right angle of the lower jaw, and in April, her father, a dental surgeon, extracted the second bicuspid tooth, there being no molars then present. A dentist, who was subsequently consulted, thought he detected an encysted tooth, and tried to extract it with the elevator. The result was an acute attack of periostitis. Profuse suppuration ensued, and on firm pressure near the angle pus could be forced up from the interior of the bone. Under treatment the inflammation subsided, and the patient went to the seaside, and on her return there was apparently some exposed bone with greatly hypertrophied mucous membrane on each side. A month later, after imprudent bathing, sudden increase of pain and swelling took place, and she consulted Mr. Heath, who found great enlargement of the bone with a fungus-like growth in the mouth, and apparently bare bone, the appearances closely resembling those ordinarily found in a case of sarcoma of the jaw. An operation involving removal of a portion of the jaw was declined, and the swelling slowly diminished again. In September Mr. Heath undertook an operation for removal of the supposed sequestrum of bone, and after considerable trouble succeeded in elevating the mass described from its bed, since which the jaw has slowly contracted to its proper shape.

The president observed that much interest attached to the case both practically and pathologically: practically, because an apparent second growth was removed by simple extraction; pathologically, because of the curious, essentially tooth-like structure of the tumor. The class of cases was rare, but it was necessary always to be on guard against errors of diagnosis in regard to them.—*Christopher Heath, before Clinical Society of London, in Medical Press and Circular.*

Fracture of the Angle of the Jaw.—About half-past two one morning last winter, a gentleman called on me, stating that he had slipped on the snowy pavement and had fallen on his left side, hitting his cheek sharply on a rounded projecting curbstone, causing

him considerable pain at the time, which returned when he opened his mouth.

On examining him I observed an excoriated and bruised, but not swollen, patch on the left cheek, and thought I felt crepitation on handling the lower jaw; but when I attempted to locate it I failed to do so, and was about to assure him that the jaw was uninjured, when again the crepitation was felt at its left angle. He was now directed to open his mouth widely, which caused slight pain; but no injury to any of the teeth or extravasation of blood along the gums could be detected. The whole left jaw was then examined by passing the fingers over its inner and outer sides within the mouth, but still no fracture could be detected. The forefinger of the left hand was then pressed deeply down between the tongue and the jaw, opposite the wisdom tooth, and the forefinger of the right hand placed firmly against the angle of the jaw outside the cheek; when by careful and firm manipulation crepitation was again produced over the angle, and it was found that a splinter of bone, about three-quarters of an inch in length and nearly a quarter of an inch at its thickest point, had been detached from the angle of the jaw, but which the muscles covering it retained *in situ*.

The treatment was merely to let the jaw have rest by eating soft food, in order to let the parts unite, as there was no displacement. I have thought it well to put this case on record, though the injury was a trivial one, as no account of any such fracture has been found in the surgical literature of England, France, or Germany.—*F. Ogston, Jr., M.D., in The Lancet.*

A Case of Pneumonia caused by a Tooth in the Bronchus for Five Days; Recovery.—Dr. T. R. Chambers, of East Orange, N. J., relates in the *Medical Record*, November 19, 1881, the case of a lady, aged thirty-five, who, on August 19, had thirteen teeth extracted from the upper jaw at one sitting. Upon discontinuing the administration of gas (nitrous oxide) she fainted. Then she was seized with severe epigastric pain, urgent dyspnœa, cough, nausea, and prostration. It was several hours before she could be removed to her home in Orange.

On the fourth day the dyspnœa, nausea, and cough continued, and in addition there was severe pain in the left axillary line on a level with the nipples, at which place there was a zone of bronchial breathing and voice, and dullness over a space not larger than a silver dollar. In the neighborhood were mucous râles. This consolidation was preceded for two days by pulmonary congestion. Sputa, scanty, serous, and muco-purulent, streaked with blood. Temperature, 102° F.; respiration, 40; pulse, 102.

The next day the temperature was 104° F.; respiration, 38; pulse, 110.

On the sixth day (August 24) at 9 A. M., there was severe coughing with urgent dyspnœa (the patient says she "thought she would be suffocated"), terminating with a spasm and vomiting, after which relief was obtained. In the matter coughed up and vomited was found a second molar tooth. It was positively certain that it did not come from either jaw at this time, as both had been carefully examined since the illness begun. Blood was abundant in the sputa,

which was muco-purulent in character. Cough very much easier. The whole lower lobe gave bronchial breathing and voice, with dullness. Temperature, 104° F.; respiration, 44; pulse, 124 (two hours after the coughing struggle).

On the seventh day the patient was generally easier. Sputa copious and blood streaked. Temperature, 100.5° F.; respiration, 32; pulse, 100.

On the tenth day prostration was marked. Copious sweats. Blood disappeared from sputa.

September 19th (one month). Patient up and about. Vesicular respiration returned to lung. Râles abundant.

September 25th. Patient well, except weak.

The case should serve as a warning to those extracting teeth to be careful to remove entirely from the mouth any tooth or part of a tooth loosened from its bed in the jaw.—*Med. and Surg. Reporter.*

The Innervation of the Salivary Glands.—The remarkably exact knowledge which we possess of the innervation of the submaxillary gland has been considerably extended by Aschenbrandt, of Cassel, who has investigated the nervous relations of the other glands of the same class; the character of the different secretions furnished by the parotid, sublingual, and submaxillary glands, respectively; and the reflex relations of these structures to certain other parts of the body, notably the conjunctiva. The experiments were made on carnivorous animals. The principal results of the investigation may be summarized as follows:—Fluids that irritate the conjunctiva cause salivation. The secretion of the parotid is influenced by the glosso-pharyngeal nerve, while the facial trunk has no share in salivation. The sympathetic is not influenced by irritation of the conjunctiva. All of the three salivary glands participate in reflex salivation. The impression on the conjunctiva is reflected through the nuclei of the nerves. The character of saliva furnished by the different glands, and obtained by the various methods of reflex irritation, respectively, may be found described in the original paper in Pflüger's *Archiv*, Band xxv. s. 101.—*The Cincinnati Lancet and Clinic.*

Hurried Dinners.—It is a mistake to eat quickly. Mastication performed in haste must be imperfect even with the best of teeth, and due admixture of the salivary secretion with the food cannot take place. When a crude mass of inadequately crushed muscular fiber or undivided solid material of any description is thrown into the stomach, it acts as a mechanical irritant, and sets up a condition in the mucous membrane lining that organ which greatly impedes, if it does not altogether prevent, the process of digestion. When the practice of eating quickly and filling the stomach with unprepared food is habitual, the digestive organ is rendered incapable of performing its proper functions. Either a much larger quantity of food than would be necessary under natural conditions is required, or the system suffers from lack of nourishment. Those animals which were intended to feed hurriedly were either gifted with the power of rumination or provided with gizzards. Man is not so furnished, and it is fair to assume that he was intended to eat slowly. We must apologize for reminding our readers of facts so familiar; but we do

this in the hope that any who may chance to have influence with the managers of large hotels, where dinners *à la table d'hôte* are in vogue, will take measures to bring about a much-needed reform in the manner in which these entertainments are conducted. At the best and most frequented establishments in places of fashionable resort, where at this season multitudes of health-seekers are wont to congregate, the hurried dinners are not only causes of annoyance, but actually go far to prevent the benefit which should be derived from a change. No sooner is one course served than the other is introduced, without giving the guest time to digest or even to swallow the first. The eagerness to secure good dividends takes a particularly mischievous form when it piles food on the plate of a customer, and compels him to consume it breathlessly. The matter may seem a small one, but it is not so. Just as a man may go on for years with defective teeth, imperfectly masticating his food, and wondering why he suffers from indigestion, so a man may habitually live under an infliction of hurried dinners, and endure the consequent loss of health, without knowing why he is not well, or how easily the cause of his illness might be remedied.—*The Lancet.*

Salivary Globules.—*Nature* records that Stricker's examination of salivary globules, under high powers of the microscope, leads him to reject the supposition of so-called Brownian (molecular) movement in salivary corpuscles. He finds the globules possess a complete, distinctly visible network, and the granules, hitherto described, are thickened points of intersection of the threads forming the reticulum. During the life of the corpuscle, there is permanent fluctuation of the threads, which under the influence of concentrated solutions of salt ceases, the reticular arrangement at the same time disappearing.—*Medical Press and Circular.*

HINTS AND QUERIES.

"He that questioneth much shall learn much."—Bacon.

Correspondents desiring a reply in this department are requested to make use of *distinctive signatures or initials*, and avoid the practice of signing their communications Reader, Subscriber, etc.

Correspondents who wish notice to be taken of their communications should authenticate them with their names. We cannot insert queries or replies except they are so accompanied. Names not necessarily for publication.

Refitting Celluloid Plates.—Will some one whose experience in refitting celluloid plates has been favorable kindly give us his mode of operation?—S.

F. J. W., in the December number of the Dental Cosmos, asks: "What is the best treatment for teeth worn down by mastication so as to be unpleasantly sensitive, and yet not in a condition to be "shod?"

When either incisors, canines, bicuspids, or molars are deprived of enamel on their cutting and triturating surfaces, the dentine invariably becomes exalted in its sensibility from loss of its normal protection. To relieve this painful condition, we need to apply some escharotic or caustic which will coagulate the albumen of the organic part of the dentine, and by the production of an eschar destroy its sensitiveness, and furnish a comparatively insoluble and non-conducting surface for the protection of the tissue beneath. The agent which does this most efficiently is nitrate of silver (*Argenti Nitras*), applied by scraping

into a powder and rubbing on with a stick properly shaped. This remedy is necessarily but temporary in its results, for the cause which established the unfavorable symptoms still exists, and must soon reproduce it. A tooth, from the surface of which the enamel has been removed by use so as to expose the dentine, needs at once to be filled ("shod") in order that it be made permanently comfortable and protected from further destruction; and this is true whether the loss of enamel be from a portion only, or from the whole of the cutting edge or masticating surface, provided the wearing away be to the exposure of the dentine. In the performance of the operation, if the tooth is an incisor, the cutting edge should be grooved through its extent, with the walls of the groove made parallel, and in this make the gold filling as compact as possible, extending it just over the cutting edges of the enamel. If the tooth at fault is a molar, wherever the dentine is exposed drill a cavity deep enough to retain a gold filling, and embracing in its lateral extent all of the exposed dentine, and in this place securely a solid gold filling. Believing that this is the only permanent remedy for the "unpleasantly sensitive dentine," it would be the course I should pursue. In the operation, care must be taken that the normal occlusion of the jaws be not interfered with by the capping of one tooth being left higher than another. In the mouths of patients where the force of mastication is great, the gold on the anterior teeth becomes hard and scales; to obviate this, coat the cutting edge with a delicate covering of a good amalgam, and in this way secure a desirable hardness sufficient to protect it from wear; this can be done without marring its sightliness from an anterior view.—C. N. P.

J. K. asks, in the December number of the DENTAL COSMOS, how to "remove the tartar from the roots of teeth where it has penetrated the sockets beyond the reach of the ordinary instruments."

There are thin flexible scalers with a barb at the end known as Sheffield's Nos. 3 and 4; procure two of these with the barbs on reversed sides; with these instruments, and with great care in the manipulation, tartar can be removed from the root or roots of any tooth, though it extend quite to the apical end of the root; to do it successfully with desirable results following it requires time and exceeding care in the operation, but it can be done.—C. N. P.

VULCANITE AND CELLULOID COMBINED.—When it is desirable to employ plain teeth placed on the natural gum in front partial pieces, and at the same time to take advantage of the clasping qualities of vulcanite, the objection to such a combination which lies in the unnatural appearance of the interdental spaces may be overcome by simply using a little celluloid in these spaces; select some of the right *pinkness*, run wax in the spaces, continuing it in conformity with the natural interdental gum of the adjoining teeth, allowing no wax on the palatal surface of the plate; invest in flask, separate, remove wax, and also cut away the vulcanite from between the teeth so as to form a "dove-tail" to retain the celluloid; heat, etc., as usual. If it is desired that the celluloid gum sink slightly *into* the natural membrane, this may be best produced by paring the original model so that the wax, rubber, and celluloid will each, in turn, assume the desired shape.—S. J. S.

"A NEW AND ORIGINAL METHOD OF TREATING EXPOSED PULPS."—I notice in the DENTAL COSMOS for December, 1881, under this caption, a quotation of a statement made by William Victor Ditcham, in the *Dental Record*, and desire to call attention to the fact that Dr. L. Ashley Faught made and used the appliance described in December, 1879.—JOS. CLYDE MACARTNEY.

Army and Navy Dental Appointments.—The subject of dental appointments in the United States army, navy, and government hospitals, is one which has occupied the minds of members of the medical profession and the dental specialty, as well as those interested in military and naval matters generally, for many years.

The necessity of proper dental treatment in the army and navy has been long conceded, and a decided change in the medical department of both branches of the service is believed to be an absolute necessity. There is certainly no reason why candidates for medical appointments in the government service may not be selected from those possessing a thorough knowledge of dental surgery. Dental chairs have been established in many of the medical colleges and universities, and oral surgery is acknowledged to be a very important branch of medicine. At present the extraction of teeth appears to be the only remedy resorted to in the service for the relief of aching teeth, and the operation, which is generally performed by an apothecary or hospital steward, is not infrequently attended by unpleasant, if not decidedly distressing results to the patient, for it must be acknowledged that in inexperienced hands the forceps are often productive of serious injury.

The government insists that men entering its service shall possess sound teeth, and yet it makes no provision for their care or preservation. The injustice of this order of things must be apparent to every intelligent person who gives the subject a moment's thought. The loss of teeth to a soldier or sailor is a very serious matter, for the reason that the food with which he is provided is generally of a coarse quality, often insufficiently or improperly cooked, and therefore less easily digested, and requiring more than the average amount of mastication; numerous diseases, many of which prove serious, are likely to arise from insufficient mastication, and this fact alone should prove sufficient to prompt our government to make, without further delay, a much needed reform in the army and navy medical departments.

During the late unhappy civil war, the South, with commendable consideration for the health and welfare of her soldiers, authorized the appointment of army dentists, and much has been published regarding the valuable services performed by them in the treatment of fractured jaws and gun-shot wounds of the face. Among the first in the South to recognize the necessity of appointments of the character referred to, and who were foremost in the good work, were Drs. S. H. Stout, Medical Director of the Confederate army, W. H. Morgan, of Nashville, Tenn., and the late Dr. Bean, of Augusta, Ga.

It is to be hoped that the profession throughout the United States will awaken to the importance of dental appointments in the government service, and that with a view to bringing about the much desired change, they will individually exert their influence with the different Congressional representatives, thereby insuring the passage of a bill (which will be presented to Congress) authorizing such appointments as will supply the present want so apparent in government hospitals, garrisons, and on shipboard.—George H. Perine, *New York*.

Metallic Cap Filling.—In the article on this subject in the December (1881) number of the Dental Cosmos ("Hints and Queries), there occurred an error which should be corrected. At the commencement of the last paragraph on page 669, in Dr. Spence's explanation of his manner of metallic cap filling, in the third and fourth lines of the paragraph the word "level" should have been *bevel*.

THE

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ORIGINAL COMMUNICATIONS.

ANTISEPTICS IN DENTISTRY.

BY WILBUR F. LITCH, M.D., D.D.S.,

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(Read before the Pennsylvania State Dental Society, July 27, 1881.)

SEPTIC matter is that which has the power of promoting putrefaction.

Antiseptics are such agents as have the power of arresting putrefaction.

I am thus careful in defining the term antiseptic, because it is my desire and intention to confine the subject-matter of this paper strictly within the limits of this definition; namely, to a consideration of those agents which are found to be most useful in the treatment of such lesions of the dental apparatus as are dependent upon or associated with putrefactive conditions.

Chief in importance among this class of dental lesions is that condition of things arising primarily from the devitalization and disintegration of the dental pulp, in which, as the result of mechanical irritation or septic infection, inflammatory action is set up in the highly vascular tissues which constitute the root-investment, such action, unless arrested, resulting usually in suppuration and the establishment of an alveolar abscess more or less persistent and chronic in its type, and more or less dependent, either directly or indirectly, upon putrefactive processes for its continuance.

Devitalization of the dental pulp, which, as has been stated, is primarily concerned in this chain of retrograde metamorphoses, may occur spontaneously without any appreciable cause; usually, however, it is the result either of mechanical violence, as from a blow, or from prolonged exposure to such irritative agencies as are necessarily associated with advanced dental caries; or from the excessive thermal changes induced by highly conductive metallic stoppings;

or from the application of chemical agents toxic or destructive in their nature.

When devitalization takes place in a closed pulp-chamber, the devitalized tissue may slowly undergo disintegration, and be as slowly absorbed; in which case many years—often a lifetime—may elapse without any marked ill effect other than discoloration, and, perhaps, increased susceptibility to caries upon the part of the tooth-substance proper.

Most frequently, however, the progress of disintegration is more rapid; the pulp-chamber becomes filled with matter more or less purulent in its nature, which, engendering gases, and being fed by osmosis from the less dense fluids with which the dental tubuli are constantly charged, soon attains sufficient volume to exercise pressure through the apical foramen, and thus act as an irritant upon the vascular tissues with which the root is surrounded.

Purulent matter under such conditions may or may not be strictly putrefactive, but it is certain to become so when brought into contact with atmospheric air through an opening made from without; an operative procedure always necessary in the treatment of this lesion.

When devitalization of the pulp takes place, not in a closed, but in an open pulp-chamber, putrefactive decomposition is the immediate and inevitable result; and whenever by accident or design a pulp-chamber thus circumstanced is changed from an open to a closed cavity, the consequence must be the accumulation of putrefactive matter and gases under pressure, and usually not only mechanical irritation but direct septic poisoning of the root-membranes. In either case, then, septic matter is that with which we have to deal, and upon antiseptic agents our reliance must chiefly be placed.

The effect thus produced upon non-vital pulp-tissue by exposure to atmospheric influences is not due, as was once believed, to the influence of atmospheric oxygen, but as has been clearly demonstrated by Pasteur and Lister, it is due to the existence in the air of minute organisms, monads, bacteria, vibriones, etc., which, when brought in contact with any animal fluid, either blood, serum, lymph, or pus, and afforded favoring conditions of heat and moisture, have the power of enormous self-multiplication, which process is in some unrecognized fashion catalytic in its nature, and at the expense of the fluid in which the action is set up; the propagation of the bacteria being attended by fermentative changes, resulting in the formation of organic acids, not only highly irritative to such vascular surfaces as they may be brought in contact with, but capable when absorbed of producing septic poisoning of the system at large. Thus it is that relatively healthy pus and lymph may by exposure to these

atmospheric agencies, through a process likened to fermentation or zymosis, be changed from a bland and innocuous fluid to a local irritant and constitutional poison.

Lister claims for bacteria not only catalytic power over pus and other animal fluids, but he also affirms that they are the active agents in the establishment of the whole process of suppuration, either in closed cavities or upon free surfaces. The world is now familiar with his deduction from these premises,—that for the proper treatment of surgical lesions it is necessary to exclude atmospheric germs by means of carbolic acid vapor, and by dressings sufficiently charged with carbolic acid to render the access of living bacteria to the wound impossible.

It is not necessary at this time to enter into any discussion of the question whether Lister's hypothesis is based upon a scientific truth, or whether, as is claimed by Beale and others, the favorable results which unquestionably arise from this treatment are due to the direct action of carbolic acid upon the wound, rather than to the destruction of bacteria.

That pus already formed, as well as all other albuminous animal fluids, when exposed to atmospheric influences under favoring conditions, undergoes those fermentative changes to which allusion has been made is unquestionable, and that such septic matter is one of the chief elements of difficulty and danger in the treatment of such pathological conditions as are associated with pulp-devitalization is a fully recognized truth. A minute portion of putrescent fluid forced through the apical foramen, as so frequently happens from pressure by a probe or drill, is certain to set up that train of inflammatory processes with which all practicing dentists are so familiar.

To this extent the part which putrefactive matter plays in lesions in dental tissue and in other tissues of the body is identical. But as the pulp-chamber is normally a closed cavity, and cannot be otherwise than a source of trouble and offense so long as it remains open and unsealed, the dentist in his efforts to restore, in this respect, the normal condition of things, meets with another impediment arising directly out of the putrefactive conditions under discussion, namely, the existence in association with all putrefactive matter of putrefactive gases, they being the final step in the putrefactive disintegration of all animal tissues, the nearest approach in the process to full resolution into the ultimate elements of which they are composed.

These gases are often described as being sulphureted or phosphureted hydrogen compounds; but MM. L. Lefort and V. Paschutin state* that in their investigations concerning the influence of phos-

Vide Chemical News, July 25, 1875.

phates and certain gases upon putrefaction they found no volatile compounds of phosphorus—such as phosphide of hydrogen—among the products of putrefying organic bodies. The probability is that the basis and chief chemical constituent of putrefactive gases is sulphureted hydrogen, its odor being modified or intensified by admixture with those volatile organic acids which result from zymotic changes.

Such gases, as already explained, collecting under pressure in a sealed pulp-chamber—a pressure so great that instances are on record in which the tooth has been violently disrupted by it—constitute a source of mechanical irritation to the tissues surrounding the apical foramen through which, if it be permeable, such pressure must be exercised. That this irritation is, or may be, purely mechanical and not specific, is demonstrated by the fact that upon opening the pulp-chamber, thus allowing the escape of the confined gases, the irritation or even inflammation which their pressure caused will often entirely disappear.

Such being the conditions under which putrefactive matter acts, we are now to consider in what manner the antiseptic agents usually employed in dental practice antagonize these conditions, and thus accomplish the purpose of their exhibition. The list of agents recognized as possessing antiseptic power is a long one; it includes, among others, sulphurous acid and the sulphites, boracic acid, benzoic acid, salicylic acid, carbolic acid, and creasote; chlorine, bromine, iodine; such vegetable bitters as salicin and quinia, and such volatile oils as the oils of thyme, with its derivative thymol, the oils of gaultheria, of cloves, of cajeput, and of eucalyptus.

All these agents arrest putrefactive processes in one or both of two ways—either by destroying the organic germs (bacteria, microzymes, micrococci, etc.) upon which putrefaction depends, or by producing such chemical changes in the albuminous constituents of the animal fluids or tissues involved as to render them resistant to putrefaction.

Without exception all antiseptics are destructive of infusoria, and a large number of them, when applied in sufficient strength, produce coagulation of albumen. This dual power is manifested in the highest degree by carbolic acid and creasote; whenever they touch or penetrate animal tissue or come in contact with albuminous animal fluids, coagulation of the albumen is the immediate result; while their power, when applied in sufficient strength, of destroying minute organisms, and of thus arresting fermentative changes, cannot be questioned.

The function of this class of antiseptic agents is, however, strictly limited to the power of *arresting* putrefaction; they exercise

no influence over those noxious effluvia and gases which are among the products of putrefaction.

In this respect a careful discrimination must be made between the powers respectively of such antiseptics as carbolic acid, creasote, oil of cloves, oil of thyme, oil of cajeput, etc., and such other antiseptics as chlorine, bromine, and iodine, which, in addition to their antizymotic power, are true chemical antagonists of those sulphureted hydrogen compounds of which putrefactive gases are constituted; such gases being immediately decomposed by them, their hydrogen element going either to the chlorine, bromine, or iodine to form respectively, hydrochloric, hydrobromic, or hydriodic acids, the sulphur being in each case precipitated.

This can readily be demonstrated by acting upon a small portion of ferrous sulphide with dilute sulphuric acid and passing the sulphureted hydrogen gas which will result from the reaction through tincture of iodine; a milky precipitate of sulphur will at once appear, and at the same time the characteristic color of the iodine will disappear, in consequence of the conversion of the iodine into hydriodic acid, a heavy, colorless gas which remains in solution in the water present in the alcohol of which the tincture is made.

The reaction is as follows:

$$\underset{\substack{\text{Ferrous}\\ \text{sulphide.}}}{Fe\,S} + \underset{\substack{\text{Sulphuric}\\ \text{acid.}}}{H_2\,S\,O_4} = \underset{\substack{\text{Sulphureted}\\ \text{hydrogen.}}}{H_2\,S} + \underset{\substack{\text{Ferrous}\\ \text{sulphate.}}}{Fe\,S\,O_4}$$

$$\underset{\substack{\text{Sulphureted}\\ \text{hydrogen.}}}{H_2\,S} + \underset{\text{Iodine.}}{I_2} = \underset{\substack{\text{Hydriodic}\\ \text{acid.}}}{2\,H\,I} + \underset{\text{Sulphur.}}{S}$$

If now the sulphureted hydrogen is passed through the strongest possible solution of carbolic acid no such precipitation of sulphur occurs; no change either in the appearance or chemical constitution of the carbolic acid is manifested, and, with the exception of a slight modification produced by its admixture with carbolic acid vapor, the characteristic odor of the sulphureted hydrogen remains unchanged. This modification of odor would be more pronounced were creasote substituted for carbolic acid, owing to the more penetrating pyroligneous odor of the creasote, but the chemical constitution and dynamic power of the gas would remain unchanged in the one case as in the other.

Hence it follows that even so powerful an antiseptic agent as carbolic acid cannot be said to be a true disinfectant in the sense that all the products of putrefaction are decomposed by its presence. No matter how thoroughly the odor of putrefactive gases in a room or in a tooth may be masked or disguised by the characteristic

odor of carbolic acid, creasote, oil of cloves, or, indeed, any antiseptic oil, the gases are none the less present although their odor is neutralized; the disinfection is only apparent, not real; the further formation of putrefactive gases may be prevented, but the decomposition of those already formed must be accomplished by those chemical agents—bromine, chlorine, iodine, and the like—already cited.

This, as will readily be seen, has an important practical bearing in dental practice. A tooth the pulp-chamber of which has been for any considerable length of time filled with putrefactive matter, is, owing to the permeable nature of its structure, practically a tooth saturated with putrefactive matter, so that many applications of an antiseptic agent are usually necessary before every particle of putrefactive matter in its substance can be acted upon; but so long as any portion of putrefactive matter remains unacted upon, gases continue to be given off; and so long as they continue to escape into the pulp-chamber so long will it be impossible to close that cavity, unless as they collect in the pulp-chamber they are there met by some chemical agent, such as chlorine, bromine, or iodine, which seizing upon the gaseous molecule, forces its elements into other combinations, destroys its gaseous character and thus renders it incapable of harm.

As already shown, the result of the reaction with iodine is hydriodic acid, itself a gas, but, inasmuch as it is exceedingly soluble in water—as is the analogous chlorine compound hydrochloric acid gas—it is instantly taken up by the water abundantly present, either in the natural fluids with which the tooth is charged or in the water present in the alcohol of which the iodine solution is made. Being in solution, the hydriodic gas, under the conditions ordinarily present in a pulp-chamber, may cease to be regarded as a factor in pressure. Moreover, should there be oxygen compounds present in the pulp-chamber the hydriodic acid itself may be regarded as a disinfectant, inasmuch as, through its strong tendency to combine with oxygen, the H I would be decomposed, water, H_2O, formed and iodine set free for new combinations with hydrogen.

By careful and repeated application of carbolic acid, creasote, oil of cloves, etc., it is, of course, perfectly practicable to successfully treat devitalized teeth, because if dressings charged with these agents are loosely applied the gases as they arise are allowed to escape, and gradually as the affected tooth comes more fully under the influence of the antiseptic agent, gases will cease to be formed; but the progress of the treatment will be very much hastened and its safety be much more assured by combining with the carbolic acid or creasote dressing a due proportion of iodine, by which com-

bination not only is putrefaction arrested, but its products decomposed. The following formula is recommended :

℞. Iodinii (crystals);
Acidi carbolici (crystals), ää ʒj;
Alcoholis, fʒij.

M. Saturate in the mixture a pledget of cotton of suitable size and place it in the pulp-canal—previously cleansed—of the tooth to be treated.

As to the relative merits of carbolic acid, creasote, and oil of cloves, the three antiseptic agents usually employed in dentistry, it is not necessary to say much. Creasote is perhaps somewhat the most efficient of the three. It is, however, more offensive in odor than the others, and for this reason, as between the two, I prefer carbolic acid. Oil of cloves while a more agreeable deodorant is not so powerfully antiseptic as either carbolic acid or creasote. Indeed its power of coagulating albumen is almost *nil.* I may state that practically all commercial creasote contains a greater or less proportion of carbolic acid; to obtain it perfectly free from this adulteration is a nice chemical result which is not often attained except as a matter of special effort.

The effects of carbolic acid and creasote upon organic fluids and tissues being so nearly identical, there is, apart from the matter of odor, but little to choose between them. Creasote, however, possesses one practical advantage over carbolic acid in the greater resistance it offers to solution in water, creasote requiring eighty parts of water for its solution, while carbolic acid is soluble in only twenty parts of water. Owing to this difference, a creasote dressing in an open pulp-chamber will usually be found to remain unchanged by the fluids of the mouth for a longer time than will a carbolic acid dressing.

This persistence is even more characteristic of oil of cloves, which is practically insoluble in pure water, except when very finely divided by means of carbonate of magnesium, although it gradually becomes dissipated in the alkaline fluids of the oral cavity.

The essential point to be borne in mind, however, is that strength or even persistence of odor is not the highest quality to be sought in an antiseptic agent; that by means of such agents the *odor* of putrefaction may be completely masked, and yet all the products of putrefaction be present unchanged in form or potency. A substitutive odor is one thing, a disinfectant is quite another and more important thing.

In this paper I have said nothing of the local anesthetic power which is so marked a property of many of these antiseptic agents, and by virtue of which the pain of pulpitis may be so readily sub-

dued. Neither have I discussed the stimulant and escharotic effect exercised by many of them—notably by carbolic acid—upon various forms and conditions of morbid tissue. To enter into a full discussion of all the many and varied powers and properties of this most valuable class of remedial agents would swell the proportions of this paper beyond all reasonable limits, and would be foreign to the object I have had in view; namely, to set forth as clearly as possible the principles underlying the use of antiseptic agents as such in the practice of dental surgery.

A CAUSE OF LESSENED PROGNATHISM.

BY DAVID HUNT, M.D., BOSTON, MASS.

(Read before the Massachusetts Dental Society, December 8, 1881.)

In Mr. Darwin's work on "The Descent of Man," page 25, New York edition, 1871, we read as follows: "It appears as if the posterior molar or wisdom teeth were tending to become rudimentary in the more civilized races of man. These teeth are rather smaller than the other molars, as is likewise the case with the corresponding teeth in the chimpanzee and orang; and they have only two separate fangs. They do not cut through the gums till about the seventeenth year, and I am assured by dentists that they are much more liable to decay, and are earlier lost than the other teeth. It is also remarkable that they are much more liable to vary both in structure and in the period of their development than the other teeth. In the Melanian races, on the other hand, the wisdom teeth are usually furnished with three separate fangs, and are generally sound; they also differ from the molars in size less than in the Caucasian races. Prof. Schaafhausen accounts for this difference between the races by 'the posterior' dental portion of the jaw being always shortened in those that are civilized, and this shortening may, I presume, be safely attributed to civilized men habitually feeding on soft, cooked food, and thus using their jaws less. I am informed by Mr. Bruce that it is becoming quite a common practice in the United States to remove some of the molar teeth of children, as the jaw does not grow large enough for the perfect development of the normal number."

Again, on page 113 of the same volume, we read: "It is asserted that the hands of English laborers are at birth larger than those of the gentry. From the correlation which exists, at least in some cases, between the development of the extremities and of the jaws, it is possible that in those classes which do not labor much with their hands and feet, the jaws would be reduced in size from this

cause. That they are generally smaller in refined and civilized men than hard-working men or savages is certain. But with savages, as Mr. Herbert Spencer has remarked, the greater use of the jaws in chewing coarse, uncooked food, would act in a direct manner on the masticatory muscles and on the bones to which they are attached."

And again, on page 309 of the second volume: "As man gradually became erect, and continually used his hands and arms for fighting with sticks and stones, as well as for other purposes of life, he would have used his jaws and teeth less and less. The jaws, together with their muscles, would then become reduced through disuse, as would the teeth, through the not well understood principle of correlation and the economy of growth; for we everywhere see the parts which are no longer of service are reduced in size."

Consulting Spencer's "Principles of Biology" (page 457, Vol. I., New York, 1879), we find that the author, after arguing that small-sized jaws could not have aided in the struggle for life, and thus could not have been produced by the survival of small-jawed individuals, goes on to say: "Here, therefore, the decreased action of these parts which has accompanied the growth of civilized habits (the use of tools and the disuse of coarse food) must have been the sole cause at work."

I venture the opinion that these extracts furnish a fair illustration of the views held by the majority of dentists. As has been seen, they present two causes of the lessened development of the jaws:

1st. Decrease of function.

2d. Correlation: which means that under certain circumstances the extremities and jaws have apparently diminished in like manner.

The statement that decreased functional activity of the jaws causes the lessening of size seems at first sight a simple statement of that law according to which the more delicate extremities of the classes not given to manual labor have been produced; but I think more is involved in decreased prognathism than is thus explained. I see no reason why a decidedly prognathous jaw-bone shall not become very much slighter as a result of lessened use of the masticatory muscles attached to it, and still remain as prognathous as ever. Without dwelling upon this point, let us see if we can instance cases where something like the reverse obtains, viz., where the jaws have been growing smaller and less prognathous, while there has been at least no decrease, and perhaps an increase of function. The history of our own country furnishes an example of a people that has descended to a great extent from peasant ancestors; from childhood to old age we have always been accustomed to a diet requiring much mastication. Those descendants of our common progenitors remaining in Europe, having remained peasants, are still as progna-

thous as they were in the seventeenth and eighteenth centuries, that is, the peasant physiognomy still characterizes the peasantry of Europe. If they eat coarser bread, we eat and have eaten more meat. As far as I have observed them, they do not affect those habits of mastication which our school physiologies have so unanimously insisted upon as necessary to easy digestion. They use the spoon on the continent to an extent that would be simply astonishing to the poorest American; yet, as we see them in England, in France, and in Germany, they have a heavy, coarse, *peasant* physiognomy, that covers much of the difference which diversity of race causes; while with us the rule is the absence of any large class possessing such characteristics. Now, a prominent feature of this peasant type of countenance is prognathism, and that the lessened prognathism of Americans is not connected with the use of a diet requiring less mastication is proved by the fact that only an approach to what I have called the peasant physiognomy is to be found among our natives in some remote corner of the country, where all other signs of progress are also absent, and where the diet is and has been for generations coarse enough to cause any amount of mastication. But, in the case of natives whose ancestors have lived in the country for six or eight generations, a large sum of influence has caused the apparent change in physiognomy. We can simplify the study of the causation of the phenomenon by noticing the changes occurring under our own eyes in the case of some of our Celtic immigrants. When Nast was publishing his caricatures in *Harper's Weekly*, he had frequent occasion for showing us specimens of the native "wild Irishman." Not the least characteristic portion of the picture was the marked prognathism. Now, it is an undoubted truth that the same oppression and injustice that has made or kept him a semi-barbarian has also simplified and qualified his diet so that it has not for ages required excessive mastication; potatoes and buttermilk never made the type of jaw Nast portrayed; as our immigrant becomes a voter and an American citizen, his opportunities for thorough mastication increase; his offspring grow up under entirely changed conditions. If Nast wishes to portray this offspring, he must emphasize the B. J. element in the cut of his trowsers, lengthen the vest, or in some other way catch the make-up of the "b'hoys," of which body he is a great part. The prognathism as a characteristic is gone, although his diet and other influences should have stimulated the development of his jaw.

Such considerations lead me to doubt the influence of change of diet and consequent change in the function of mastication in decreasing the prognathism of people passing from savage to civilized life, and confirm the opinion which I have already expressed, viz., that

a decrease in size of the maxillary bones, resulting from decreased use of the muscles of mastication, would not result in that special modification in shape characterizing the orthognathous jaw. Think of the characteristics of the jaws of ruminants, carnivora, rodents, etc. If these types of jaw have been produced chiefly by variation in function, why is it that the pretended change in function of the jaw of man, though less in degree, has not been of the kind which these greater changes indicated. Have we not a right to expect from a study of these great examples, and from our knowledge of physiology, that change in diet and change in function of the muscles of mastication should reduce the size of these muscles, and the ridges and angles at their points of insertion, rather than produce the shortening of the posterior dental portion of the jaw which probably causes lessened prognathism? Can lessened action of the temporal, masseter, and pterygoid muscles on the one hand, or of the digastric mylo-hyoid and genio-hyoid on the other, produce anything like the change in question? Can we not distinguish prognathism in an aged individual, and are not senile changes emphasized examples of changes which lessened muscular action would cause (*i. e.*, emphasized by general failure of nutrition, by senile decay)? Finally, if this change is brought about by lessened muscular action, how shall we account for the fact that the upper and lower maxillary bones are affected in equal ratio, so that the two bones are as well adapted to each other in civilized as in savage man? Surely a greater amount of the muscular force employed in mastication is exercised by means of the inferior maxilla, and changes in the amount of function should affect the lower jaw to a greater extent than the upper.

As to the causation implied in the statement of the correlation between the jaws and the extremities, we need say nothing, since the word correlation in this connection is merely a convenient formula for describing phenomena the cause of which is unknown.

We have purposely used only the most general terms in our discussion. In stating my own hypothesis as to the cause of the change of shape in the jaw of civilized man, I shall endeavor in the same manner to avoid all details.

Although the earliest history of the human ovum is imperfectly known, we are certain of its likeness, in general features, at least, to the history of the ovum of other mammals. We know that it divides into a number of cells; that these cells soon arrange themselves in different layers; that the outer or epiblastic layer gives origin, primarily or secondarily, to the central nervous system, the organs of sense, the skin, hair, teeth, etc. Between this outer or epiblastic layer and the inner or hypoblastic layer of cells, we have a middle or mesoblastic layer, that gives origin to bones, muscles,

blood-vessels, and, generally speaking, to connective tissue. We may confine our attention to the epiblastic and mesoblastic layers—for the head, the part with which we are concerned, is formed of these two layers. Nowhere in the body is there such an expanse of organs formed from these two layers in juxtaposition.

In the human embryo, at about the end of the first or the beginning of the second month, we find much the same condition as is presented in a pig embryo one-fourth of an inch long. The head at this stage is a very simple affair. It consists principally of a mass of nerve-tissue, of epiblastic origin, forming the wall of the brain and eye vesicles. These structures are incased in a mass of simple mesoblastic or connective tissue, which is to form the skull. At this time the first branchial arch, containing that portion of this connective tissue which is to form the two maxillary bones, consists of a root attached to the mass of the head plates, as the connective tissue in this region is called, and two processes, an anterior for the superior, and a posterior for the inferior maxillary bone. Now, if we make a section of the head at this or a little later stage of development, so that the section shall extend through the eye in a nearly horizontal direction, we shall bisect a large ganglion—the embryonic Gasserian ganglion (we use this name, although at this stage almost all the other nerve ganglia of the head are included in it). As Kölliker observes, we know but little as yet of the development of the head-nerves and ganglia. Kölliker mentions the great size of the ganglion in question, but it has some relations which, to my knowledge, have never been noticed. Among these relations is the one upon which is based the hypothesis to be presented in this paper. I allude to its proximity to the root of the first branchial arch. Every one who has had occasion to examine young embryos must have been struck with the fact that, in very early stages of their development, there is but little difference in form between the embryos of different animals. Thus, a pig embryo one-fourth of an inch long, and a human embryo of the same length, vary but little in shape. The pig embryo is hardly recognizable as such until it is about an inch long, and the human embryo is hardly recognizable as human until it is nearly as long. At this stage, however, the great frontal development of man is easily recognizable. Of course the difference exists before we can recognize it, and it struck me that the same influences that were causing the increased growth of brain tissue must affect the growth of the Gasserian or trigeminus ganglion in the human embryo. In this early stage the sum of all the hereditary effects of the greater use of the muscles of the face in civilized man (a use occasioned by the greater amount of emotion and thought, as well as by simple mechanical causes) are centered almost

wholly in this ganglion. The same law, in other words, by which the growing brain of the embryo of civilized man is molding the connective tissue which is to form the skull into a type that chondrification and ossification render permanent, must operate to increase the size of this ganglion; for it and its derivatives supply almost all the muscles and organs of the face that express the principal characteristics, aside from the frontal development, that distinguish the face of civilized man from that of the savage. Such an increase of the ganglion probably exerts an effect upon the branchial arch which is to form the jaws; for the greater part of the ganglion is composed of connective-tissue cells. (The relation of neurilemma and nerve-tissue proper are quite different in the embryo and the developed individual.) This effect can only be to reduce the amount of connective tissue of the arch, and would be exercised principally upon the root of the arch. It does not seem a very remote conclusion to suppose that this result is manifested in the developed individual in a shortening of the posterior dental portion of jaw, which Schaafhausen says characterizes the maxilla of civilized man. The hypothesis has at least one striking fact in its favor—it furnishes a much clearer explanation of all the phenomena involved than that which we have criticised.

There is one evident objection to our supposed increase of the ganglion—it is not, or rather has not been, noticed in the developed individual. We are all aware of the effect of the increased growth of the hemispheres of the brain, but we have not, as far as I know, any notice that the Gasserian ganglion is larger in the civilized than in savage man. I think, however, that the fact that the Gasserian ganglion soon completes its stage of rapid increase in size, that it then breaks up into the other ganglia which are formed from it, and that the fragments which we know as the Gasserian ganglion in the adult are very soon inclosed in the early formed cartilaginous base of the skull, explains the appearances. It was during its period of rapid growth as a single body that it made its relatively great demand upon the connective tissue of the branchial arch. During the period of growth its increase in bulk is much the same as that of the embryonic eye, and it is also of nearly the same size. This statement is sufficient to show that it is possible for it to exert no little effect upon the growth of the arch.

If we attempt the application of our hypothesis in the case of the immigrant previously mentioned, we should explain the phenomena involved by supposing that the political and social conditions in America are such as to break up pretty completely the settled hereditary peculiarities that go to form a "peasant" class. We occasionally read in our metropolitan literature of American peasants; but

nature herself rapidly molds our peasant type of physiognomy into a recognized American form. Of this form, that characteristic portion, the jaws, is affected in a general way by the same increase in brain tissue that causes greater frontal development. For this increase causes a relative decrease of the enveloping connective tissue which forms the skull, and from which the jaws take their origin. The increase of the Gasserian ganglion, parallel to that of brain-tissue, and produced by the same causes, effects a local decrease of the tissue of the first branchial arch, which forms the jaws; and hence results the lack of room in the jaw for the development of the teeth. The struggle for existence in America takes on a new character; muscle and brawn are of no greater relative value than they were at home; but a new field is opened up for the play of higher faculties. The peasant becomes a landholder, a voter, a citizen, with all the care, and thought, and hope that the terms imply. His offspring begins in the school to acquire increased power for exercising the new functions, and the result is that that portion of the organism through which the new functions are exercised increases at the expense of the organs of mesoblastic origin, which were relatively more employed under former conditions.

From this view—that progress disturbs the relation of epiblastic or nerve-tissue to mesoblastic or connective tissue—it is possible to infer the existence of an unnoticed factor in these powers operating to produce animal variations. It is interesting to observe that this factor is one that must in the nature of things operate in the case of man alone. In the case of no other animal have causes operated to destroy what we may call the equilibrium of the embryonic layers; but it is manifest that hereditary causes, furnished by man's environment, acting upon parts in motion, so to speak,—parts in which the equilibrium has been disturbed—must have an effect unlike that following the action of the same cause operating upon parts in a natural state of repose. Thus, by way of illustration, it is evident that other animals have suffered as great or greater changes in diet, and as great or greater variations in the size of the jaw as has man; but in the case of animals we do not find the trouble with the late developed molars such as is observed in man. True, it is stated that the hairless Japanese dogs are liable to decay and imperfect development of the teeth; but these phenomena are all associated as results of external influences affecting organs originating from the epiblast, so that hair and teeth suffer in common. Perhaps something like a parallel action of nearly like causes might be discovered by a study of the results of the mixture of the black and white races among us. Continuing our illustration, the history of the variation of animals affords no parallel to the phenomena ob-

served in a case of a clannish people, marrying among themselves, holding to their old tastes, and still undergoing a remarkable series of physical changes not to be explained by variations in diet, climate, or any other of the elements constituting the forces whose actions have been studied in the effects produced upon animals, domesticated or otherwise.

How many of the pathological lesions characterizing the progress of mankind in civilization are due to the fact that the reactions between man and his surroundings affect, in his case, organs derived from embryonic layers whose natural relations have been disturbed, we do not know. I think, however, that the variations of the human eye are connected with this same condition. No animals, and few if any savages, have suffered in this respect as civilized man has; yet animals, at least, have undergone changes which are the same in kind as those which have affected civilized man. Allowing that they are less in degree, it seems as if some results should have followed their action upon animals, provided that these changes have produced all the results ascribed to them in the case of civilized man. Another hint is furnished by the very different condition of the eye and the ear in man. It is noticeable that the ear, as a whole, has varied but slightly during the progress of mankind. The opposite is true of the eye. According to the hypothesis which we have brought forward, we should expect, from the embryology of the two organs, just such a result. The eye is for a long time a part of that portion of the brain upon which civilization has exerted the greatest effect—that is, the anterior portion of the fore brain; while the ear has a comparatively independent origin, and is soon incased, so far as its higher parts are concerned, in a cartilaginous cochlea, and this is again incased in the base of the skull.

Finally, if we have produced a substantial objection against a minor point of Mr. Darwin's teachings, we trust we have thrown out suggestions that may extend their applicability to the case of man.

REGULATION OF TEETH MADE EASY BY THE POSITIVE SYSTEM.

BY J. N. FARRAR, M.D., D.D.S., NEW YORK CITY.

(Continued from page 15.)

No. XVIII.

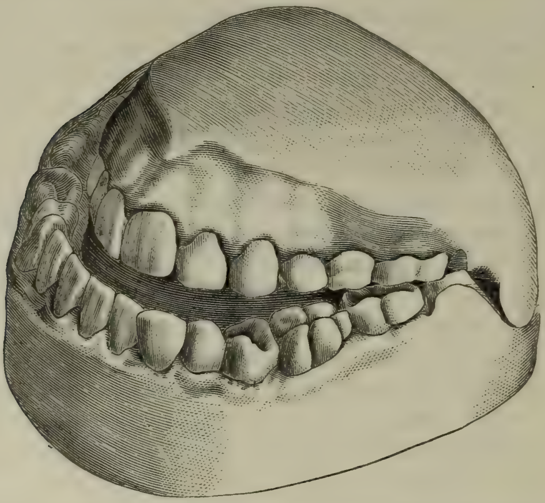
Enlargement of the Arch.

In order to illustrate the injurious effects of imperfect mastication of food upon the general health, due to improper antagonism of the teeth, and at the same time to show the benefit of successful correction of irregularly arranged teeth, as well as to furnish the ex-

planation of one of my favorite methods of dealing with difficult cases with somewhat complicated appliances, the following instance has been selected:

Several years ago a family of five healthy, robust daughters were placed under my care for preservation of their teeth. The dental arches of one of them did not properly antagonize. The upper one was much smaller than the lower, and, but for the partial antagonism of the posterior molars the upper arch would have shut completely inside of the lower. Under these circumstances the teeth were practically of little or no use for the purpose of mastication. Besides the above defect the two dental arches were hindered from closing upon the proper plane by the antagonism of these posterior teeth, which prevented the front ones closing sufficiently; it also necessitated considerable effort in closing the lips, making it somewhat difficult to articulate certain sounds well.

Fig. 109.



Appearance before the Operation.

Fig. 109 illustrates the exact appearance of the jaws when closed.

These conditions of anatomical abnormality caused considerable further distortion of the face by an apparently undue prominence of the chin, from the recession of the upper lip.

The father's attention was drawn to the matter, and he was told that if something was not done to insure better mastication, his daughter's health would sooner or later fail through indigestion; but he said that as she had always been healthy he thought she would probably continue so; consequently the matter was dropped.

Five years later, when in her twenty-second year, her health began to fail (as was predicted) from indigestion, and she was troubled with gastric pains, increasing in severity. In the autumn of her twenty-third year she experienced an attack of so severe a nature as to convulse and prostrate the entire system. This was followed by another and severer one after about one month, and this in turn by another every two weeks; and they continued to increase in frequency until they were of daily occurence. She finally became so prostrated that she broke down completely, and was confined a good deal of the time to her couch.

At this time, the stomach being unable to retain solid food, she subsisted upon liquids in the form of beef tea and broths, and upon boiled rice and cream. She became reduced in flesh and strength until her friends began to think her health was permanently ruined, and some of them regarded her death as a matter of but limited time. Weak and feeble, and not deriving much benefit from her medical adviser, so long as she remained at her home, she was finally removed to his residence, in order that the case might be more closely watched by him. Under such vigilance she began after a time to improve slowly, and the convulsive attacks became of less frequency until toward spring she had only one or two per month, and felt well enough to return to her own home, and a few weeks afterwards was able to visit the city, a distance of fifty miles, whither she came to consult me in regard to having her teeth made more efficient for mastication.

The substitution of artificial dentures for her beautiful natural teeth was not to be thought of for a moment; but we concluded that by proceeding carefully with apparatus operated upon the intermittent principle of action, which properly managed would cause little or no pain, her teeth might be successfully regulated; certainly so, if alternated by periods of rest at stages in the process when it might be practicable to suspend action. In accordance with this plan the case was commenced in the following January.

As the patient was yet weak and occasionally subject to prostrating attacks of indigestion and vomiting, requiring continued medical treatment at her country residence, the apparatus was constructed in such a manner that the patient could operate it herself; and to insure success it was arranged upon the best principles of mechanics that I was capable of devising, regardless of expense. How, will be explained later.

Measurement of the dental arches showed that the difference between their transverse diameters on a line drawn through the bicuspids was about four to five-eighths of an inch. The lower incisors were in advance of the upper ones somewhat more than

one-eighth of an inch, and owing to the peculiar conformation of the posterior portion of the alveolar ridges, which caused the posterior molars to occlude before they should, the cutting edges of the front teeth could not close sufficiently by about one-eighth of an inch.

The first step in the operation for regulating the teeth was to correct this last-mentioned defect as much as possible by grinding down the molars. Examination showed, however, that if the left third molars were ground *even to the gum* it would not be sufficient; therefore it seemed necessary to cause *absorption* of this portion of the alveolar ridge. In order to accomplish this shrinkage these teeth were extracted. This proved after a few weeks to be very successful. The gums at this point, however, were nearly in contact for a long time afterwards.

The cusps of the remaining molars were then ground down as much as was prudent for the time being. At this stage of the case the cutting edges of the incisors were enabled to close upon the same plane, but not enough to enable the upper teeth to shut sufficiently over the lower ones, when the completion of the spreading of the arch should make that a necessity to hold them in place. When the mechanical portion of the operation was completed the molars were again ground without causing pain. This grinding of the teeth not only gave increased capacity for masticating food, but improved the expression of the face by shortening it, and by enabling the patient to close her lips naturally and without effort.

A remark may be fittingly made here in reference to grinding teeth, as some adversely criticise such a measure. I advocate judicious grinding only—that which confers great benefit with no disadvantage, as in cases like this.

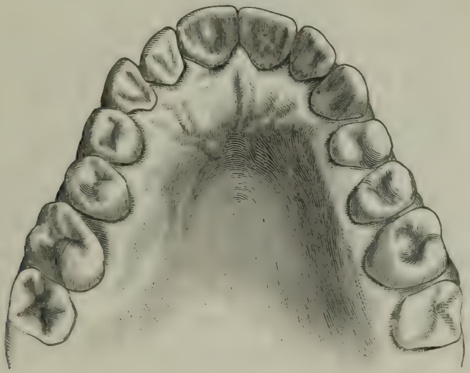
Although grinding the *antagonizing surfaces* may, when it is improperly done, cause, in rare cases, continued sensitiveness, there is no danger of causing decay. Should continued sensitiveness follow the operation the rubber dam should be applied, the tooth dried, and the ground surface cauterized with chloride of zinc.

In grinding teeth it is well to allow short periods of rest (one or two seconds), in order to avoid pain from heat caused by the rapid motion of the corundum wheel, a pain that sometimes misleads to the belief that it is from traumatic injury of the dentine.

In this operation all the necessary grinding on any particular tooth should be done at one sitting, if it be possible to do it without causing pain. If it cannot be sufficiently ground the operation should be suspended for several months, until enough time shall have elapsed for the consolidation of the peripheral extremities of the dentinal tissues (tubuli), should any be exposed. This solidification not only prevents sensitiveness, but hardens the surface.

As the main object of the operation for this case was the improvement of the health of the patient, the upper jaw received the principal share of attention, the lower teeth being altered only sufficiently to better fit the needs of the upper arch when it should be properly enlarged. As before said, the lower arch was much larger than the upper, and appeared at first sight too prominent; but this was mainly apparently so, and was due to the relative difference in the size of the two jaws. Fig. 110 illustrates the appearance of the upper jaw before the commencement of the operation.

Fig. 110.



While the upper jaw was too small to be in proportion with the other parts of the face, the lower jaw was not, and only required slight alteration in order to proper antagonism. The lower arch, however, was somewhat crowded in the region of the cuspid teeth, which were inclined forward, lapping and partially hiding the front of the lateral incisors. The bicuspids also had not sufficiently erupted to be on a plane with the antagonizing surfaces of the others, and to all appearances were stationary.

To regulate the lower arch one of the bicuspids on each side was extracted, and the cuspids drawn back by means of gold clamp-bands extending around the molar teeth; the bands being operated by screws and a key.

The matter of elevating the remaining bicuspids to their proper level was left for future consideration.

Fig. 111.

The third and main step, the spreading of the upper arch, the most interesting portion of the operation in the case of this feeble

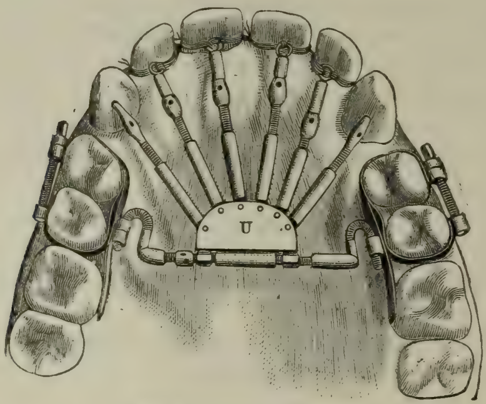
patient, was successfully accomplished in stages, intermitted by periods of rest occasioned by necessity. The first step of the operation upon the upper jaw was the partial outward movement of the bicuspids and first molars, by the use of a hard rubber plate with steel fish-tail-headed screws, as explained in No. XII., p. 233, May, 1881, Dental Cosmos.

This plate was semi-daily removed from the mouth, washed, and the projecting portions of the screws "lengthened" and readjusted. It was so operated until it had moved the teeth outwardly to that extent that it could not be further usefully retained by impingement, for reasons given in paper No. XIV.

On account of the patient's impaired health she could not visit me oftener than once in several weeks during this portion of the operation, and the case necessarily progressed slowly, so that while the apparatus was doing active duty for only about a week all told, it was allowed to serve as a retaining plate most of the time.

At this point we enter upon the second stage in the operations upon the upper jaw. It being impracticable to continue further upon the principle of impingement, this plate was substituted by a different device, made of gold, which could be bound to the teeth so that it could not slip off. It consisted of a system of jack-screws capable when used entire of acting upon twelve teeth at the same time, as shown in Fig. 112.

Fig. 112.

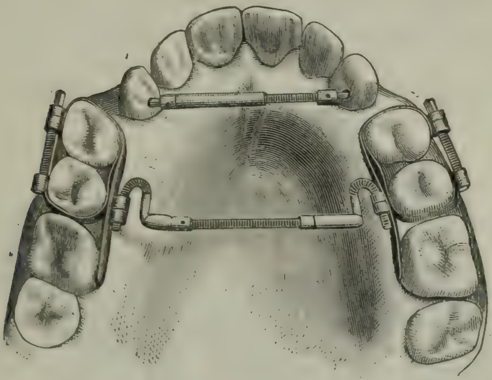


Closing Scenes of the Operation.

In this case, however, only a part of it was applied at first, the remaining portion being added at a later period in the operation. The portion used consisted of a double-yoke jack-screw, with a bar extending against the first molars, which was firmly bound to the bicuspids by means of screws and nuts as shown in Fig. 112.

The use of this portion of the apparatus was to force still further outward these six side teeth—four bicuspids and two first molars. During the latter portion of the time that this fixture was being used separately, a cylindrical spindle jack-screw was placed across the mouth, the points of which were set in little artificial pits, made in the lingual surfaces of the cuspids, for the purpose of forcing them directly outward before being carried forward.

FIG. 113.



Operation Half Complete.

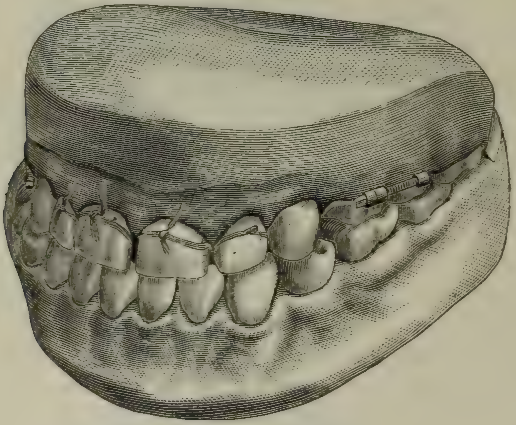
Fig. 113 represents the appearance of the upper jaw at this time. As will be seen, the six side teeth were nearly in position. After eleven weeks of irregular management, these instruments had carried the teeth sufficiently outward to be directly over the lower arch. At this point the masticating functions of the teeth being perfect, these appliances were exchanged for a simple hard-rubber retaining plate, and the treatment suspended for several months, until it was convenient for the patient to visit me.

At this time all the upper teeth were in their proper positions except the six front ones. The cuspids yet required to be forced a little anteriorly, and the four incisors, which had not been thus far acted upon at all, required to be forced radially outward, over, and in advance of the under teeth. This was the next and last step in the operation.

When she finally was able to visit me the retaining plate was removed, and the yoke jack-screw, which as before said was a portion of a larger apparatus was reinserted in its former place, not only to hold the four bicuspids and two first molars in position, but to serve as foundation to support the other portion of the compound system of jack-screws above alluded to, for the purpose of forcing outwardly the six front teeth. This portion consisted of six spindle-pointed jack-screws attached by rivets or sockets to a body, U, as

shown in Fig. 112, which was fixed to the larger and more powerful yoke jack-screw on the side teeth. These six screws radiated from the body, U, like the sticks of a spread fan. The radiating principle used in the fan portion of this machine, which for a long time I supposed was entirely original with me, I am happy to acknowledge I subsequently learned from Garretson's "Oral Surgery" had previously been used in a somewhat similar way, though I think in a rather primitive degree of development, by Dr. A. Westcott. With this apparatus resting upon the firm yoke jack-screw in the rear, and the points of the spindle jack-screws firmly set in gold sockets tied to the four front teeth, as illustrated, these teeth in exactly one month were carried into the desired positions.

Fig. 114.



Operation Completed.

Fig. 114 shows the appearance of the two jaws at the time of completion of the operation, and before the apparatus was removed.

The superiority of this machine lies in its completeness of adaptability of means to ends. Through the agency of screw clamp-bands, it is prevented from slipping off of the side teeth, as would occur with spring clasps only, and by the use of metallic sockets tied to the incisors the spindle jack-screws are made more secure than could possibly be the case if they rested in pits, because these will seldom offer opportunities for sufficient depth. These, with the various other adjustable nuts and screws, render the entire apparatus exceedingly practical and positive.

This interesting device not only works admirably but it is easily managed and kept clean. A simple rinsing of the mouth is all that is necessary to cleanliness with this apparatus as with most other skeleton devices. For this reason if for no other I think stationary plates should never be used when it is possible to avoid it. Collec-

tions of decomposed food under and about regulating devices should never be allowed to remain, as they are especially destructive to teeth that are undergoing such operations.

FIG. 115.

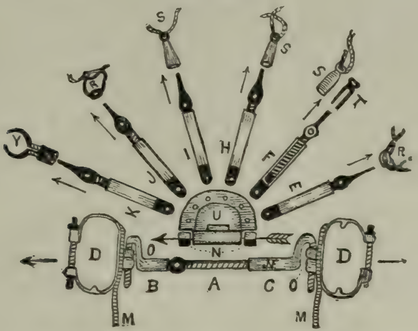
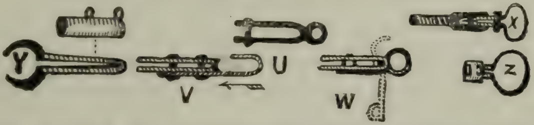


Fig. 115 illustrates the entire machine and its associate sockets as they would appear disconnected.

A, B, C, represent the different parts of the yoke jack-screw; D, D, the yoke-clamps; O, O, the adjustable nuts for securing in position the curved extremities of the large jack-screws, B, C, which by them may be set forward or back through the staples on the clamp-band bars, M, M, if desired. This motion is to alter the pressure collectively upon the six front teeth. K, J, I, H, F, E, spindle jack-screws belonging to the fan system. Y, R, S, T, X, Z, represent different modifications of socket devices that may be attached to the front teeth for holding firmly the spindle-points of the screws of the fan system. N, nuts which play on the screw A for holding the body U in any place desired.

FIG. 116.



U, V, W, of Fig. 116, are different views of various modifications of the body of the fan system, U, of which is fixed, and V, W, detachable without removing the large jack-screw, A, from the mouth.

While the fan system was acting upon the six front teeth, an increased pressure was maintained against the six side teeth by the yoke jack-screw, so that in all twelve teeth were being acted upon at the same time, as illustrated by Fig. 112. The object in continuing pressure upon the side teeth was partly to maintain firmness of the entire apparatus, and partly to carry these teeth somewhat beyond the location intended for them to finally remain in, for experience has shown that it is much easier to retain teeth in position, if this is done, and the teeth are afterwards allowed to fall back somewhat. This same philosophy was applied to the front teeth, and it is

my rule of practice, and one that I would recommend to others. The matter of *retention* is sometimes more difficult than that of moving.

Owing to the patient's feebleness, and the distance rendering it impossible for her to see me often, this case was under my care about a year, but the time of actual work upon the under teeth was about four weeks, and upon the upper about sixteen and a-half weeks, including about a month of short periods of inaction. But if circumstances had been such that she could have visited me once in three or five days this active period would have been considerably less.

This case is described more to show hygienic possibilities, and the practicability of a complicated machine, than speed of action. Under more favorable circumstances the enlargement of the upper arch could have been entirely completed in one month by a rapid process, the philosophy of which will be explained in some future paper.

The change in the position of the teeth was made so slowly that they moved principally by actual absorption of the alveolus, and were consequently the more easily retained in their new positions, the upper ones by a simple hard-rubber plate, and the lower by a skeleton inclined plane which fitted entirely around the four incisors, and which, although it did not entirely hide the teeth, extended along the cutting edges, so that it also acted as an auxiliary to the retaining plate by slightly lengthening them in effect, thus holding the front upper teeth in a sufficiently anterior position. I generally require patients to wear retaining plates two years.

The question may arise in the minds of my readers, Could not all of these upper teeth, after all, have been acted upon at the same time? In reply I would say that while this machine is so intended to be used, in this case, as before hinted, the patient was so feeble that it was thought all-important that her grinding teeth should be made useful with as little personal inconvenience from the apparatus as possible, for it should be borne in mind that she was yet occasionally subject to severe attacks of vomiting. These points having been gained the other portion of the machine was applied and worn without much annoyance.

I received a letter recently from this patient, in which she says: "My teeth remain as you left them, and during all these years there has been no recurrence of those horrid attacks. Feel assured that you have my sincerest thanks for your undertaking, as I am certain I should not have lived to see this day if my teeth had remained as they were."

(To be continued.)

PORCELAIN CROWNS ON NATURAL ROOTS.

BY HENRY WESTON, PHILADELPHIA.

Thirty years ago one of the most important duties of the dentist was the attachment of porcelain crowns, known as pivot teeth, to the roots of natural teeth. With the few forms then to be had, poorly adapted as they were, the average operator inserted hundreds, even thousands of these teeth. There were experts in those days who restored lost tooth crowns in this manner with a skill and ingenuity worthy of the finest operators of the present day.

Then all anterior teeth, living or dead, requiring what are now known as extensive contour operations, were excised without hesitation, and porcelain crowns inserted on their roots.

With the advent of cohesive gold the pivot tooth became a thing of the past, and ten years later was entirely forgotten, except by a few of the older practitioners. Ten years ago it was easy to find men who had been engaged in active practice for a decade or more, who had never inserted a porcelain crown. Of late this long forgotten subject has been revived, and it is to-day one of the leading topics of discussion by the profession.

It is not the object of this article to discuss the merits or demerits of the various plans which have been practiced—undoubtedly great benefits have been derived from each of them—but to describe an entirely different method of attaching porcelain crowns to natural roots, a method which is practical in every particular, and which will commend itself alike to the conservative soft-gold worker, to the more artistic cohesive-gold builder, and even to the New Departurist.

This plan comes entirely within the province of the operative dentist, requiring only, perhaps, half an hour's mechanical work, and that of the simplest character. When finished properly there is simply a gold or amalgam filling faced with porcelain. This crown represents on its labial surface the ordinary plate tooth, the lingual

Fig. 1.

Fig. 2.

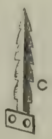


Fig 3.

Fig. 4.

or palatal surface being concaved in such a manner as to afford the largest amount of working room without impairing its strength at any point. The pins are so imbedded in the thickest part of the crown that it is not liable to be weakened by grinding. Fig. 1 represents the crown.

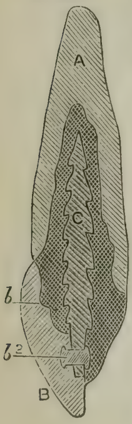
The pin is made of hard platinum or platinum and iridium, and is spear-shaped and notched on both edges to give firmness to its anchorage. The backing is of the same metal and strongly soldered to the pin. Fig. 2 represents the pin.

The operation consists of taking a cast of the root and of the adjoining teeth to be used in the selection of the crown, and with reference to proper articulation. This may be done either before or after the preparation of the root for the crown; if before, cut as much from the cast as you propose to remove from the natural root. The preparation of the root for the reception of the crown consists of the removal of that part of the tooth to be replaced by the porcelain. If a large portion has to be cut away, coarse burs may be used at first, but the finishing should always be done with the finest and sharpest. Fig. 3 shows the root at this stage.

The enlargement of the pulp-canal is next in order, and is most readily accomplished by the five-sided reamers used with the dental engine, and which are represented in The S. S. White Dental Manufacturing Co.'s list as Nos. 146, 147, 148. The pointed fissure burs, Nos. 171, 172, 173, will also be found useful for the purpose, and for shaping the retaining points and under-cuts, cones Nos. 25 or 26 and 27. The canal must be sufficiently enlarged to allow space for packing gold or amalgam securely about the pin. Good judgment is required at this stage of the operation, as to the removal of neither more nor less dentine in the enlargement of the canal than is necessary. Fig. 4 shows the root prepared for the reception of the pin.

Fig. 5 represents a transverse section showing the position of the pin in the root. The grinding of the crown to the root requires but little labor, and the fitting may be done directly on the natural root, or on a cast taken after the root has been prepared. It must always be done with the utmost neatness and precision. When fitting, the crown can be held in position by a cone of wax inserted in the root.

Fig. 5.



Next comes the adjustment of the pin to the root and crown. After punching holes in the backing to receive the pins of the porcelain crown, bend the pin with small flat-nosed pliers, so that when in its proper position there will be a uniform space around its entire surface. Secure the tooth and pin together with a cement of resin and wax; invest in plaster and sand, and solder with fine gold solder. It has been my practice of late years when preparing the root to leave just a line of enamel around its entire circumference, thus securing a joint clear of the free edge of the gum, especially when gold is used.

The propriety of this method may be questioned by some, but my success in this particular justifies my belief that it is the best plan where feasible. What dentist ever cut away sound dentine or enamel for the purpose of concealing the margin of his filling under the free edge of the gum. The cases are analagous and the comparison fair. If gold is to be used as the attachment, the rubber dam is indispensable. When amalgam or cement is used the rubber dam is of decided service, but it may be dispensed with by those who prefer other methods of keeping out moisture. When gold is to be used, the root having been previously properly treated and everything in readiness, and the rubber dam in place, put upon the point of the pin a pellet of phosphate or oxychloride of zinc, the size of a No. 7 or 8 excavating bur; now press the pin and crown carefully to their exact position into and upon the root, and with a delicate but blunt-pointed instrument thin enough to reach the end of the canal, pack the cement firmly about the pin. The object in using the cement is to secure the pin in its place during the first introduction of the gold. By using the hot-air syringe the cement will harden in two minutes. Close the opening of the canal about the pin with a rope of bibulous paper, and attach the crown to the root and adjoining teeth on either side with soft wax; see that the joints are exact in every particular, as after the next step mistakes are not easily remedied.

Paint the joint from the labial side with cement mixed to the consistence of cream. Cover the labial surfaces extending over the cutting edges of the porcelain crown and adjoining teeth to the thickness of three-eighths of an inch with carefully mixed impression plaster. When hardened the plaster may be cut from the cutting edge of the crown, and the wax and the paper removed. Now paint the palatal side of the joint with the cream-like mixture, applied with flattened pulp-canal pluggers. Harden with hot air, and the case is ready for the gold. This will be best understood by old operators, who formerly used gold for filling pulp-canals. The beginning should be made with soft semi-cohesive No. 4 gold foil, cut into $\frac{3}{8}$-inch strips and rolled into fine ropes. Cut this into $\frac{1}{2}$ to $\frac{3}{4}$-inch lengths, and thoroughly pack one at a time about the pin. Other numbers of gold foil may be used, but the finer and smaller the gold at this stage of the process the better, in order to avoid choking the canal. The instruments should be finely serrated, well tempered, and bent and shaped at such angles as to reach all parts of the canal. With the foundation well secured, the gold may now be annealed, and as before condensed, one piece at a time. As the work advances heavier ropes can be used, but they must not be cut longer. Still heavier gold may be added as the canal enlarges, and from this

point to the completion of the operation the various grades and forms of cohesive gold are applicable, as blocks, cylinders, mats, etc. When finished, and the exposed dentine and enamel are all covered with cohesive gold and porcelain, the result will be a fac-simile of Figs. 6 and 7.

If preferred, the cement in the labial joint may be dispensed with, and the space between the crown and the root carefully filled with gold after the removal of the plaster covering all of the exposed root, showing only a fine line of gold at the margin of the gum. The operation just described may be simplified and perhaps improved upon in a practical point of view, without in the least sacrificing its strength, beauty, or durability, by filling a portion of the canal around the pin with amalgam, leaving room only for a secure foundation for the gold. There is no question about the propriety of this practice, and no doubt about the results, which are probably in favor of the amalgam.

Fig. 6.

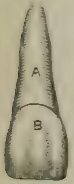
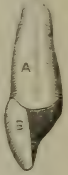


Fig. 7.



In most cases, its easy adaptability to the walls and undercuts adds greatly to its value. When the canal is necessarily small, owing to the size of the root, the cement at the end of the pin may be dispensed with, and the canal filled half or two-thirds full of amalgam, soft enough to allow the pin to pass readily through it to its proper position. After having been secured with plaster as before described, the excess of mercury may be readily taken up by packing thoroughly about the pin more amalgam with the mercury previously expressed—continuing the operation as before described. Amalgam for the entire attachment answers all practical requirements fully, and when we consider the ease with which this operation is thus performed, compared to that with gold, the time and labor saved to the dentist, and the advantage in point of cost to persons in moderate circumstances, the odds are largely in favor of this material. The selection of the proper amalgam for this purpose is of the greatest importance. It should be full, hard, and strong, hold a sharp thin edge, and keep its color in the mouth. While the many preparations in the market may answer the purpose for which they are intended, not one in five posesses these requirements. Where amalgam is used exclusively for the attachment the greatest accuracy should be observed in the proper articulation of the crown before introducing or packing it and in removing carefully all excess, and the patient should be cautioned against biting on the crown until the following day. The manner of preparing the crown, pin, and root, and filling the latter, is the same as before described. Use a trifle more cement at the point of the pin, and apply more on the palatal side of the joint to prevent a dark line showing. It is claimed that

amalgam produces dark joints and unsightly discoloration, and it is in such places that the superiority of gold asserts itself over all other materials.

If the attachment is to be made entirely of any of the various cements, fill the canal half or two-thirds full, press the pin through the cement to its place, and pack tightly with small blunt-pointed instruments slightly oiled to prevent sticking. With a new mixing fill and cover the joints; harden with hot air; remove enough cement from the canal to secure thorough anchorage; mix more cement thicker than the last; finish and harden as before. In every case the greatest care is required in the proper articulation. Instead of making this porcelain tooth assume the burdens of its healthy living neighbors, its labors should be lightened. Careful articulation alone does this.

Always insist on seeing the patient in a few days if possible. Five or ten minutes' work at this time may enhance the value of the operation tenfold. The use of articulating paper is indispensable in securing the desired articulation.

TRUTH VS. FICTION.

WHEN Dr. Flagg, in the last October number of the DENTAL COSMOS, endeavored to hold me up to ridicule by publishing in parallel columns extracts from my articles written in 1846 and 1847, he was so wanting in the spirit of fairness and truth that he perverted and withheld the most important part of my article of '47, that it might seem inconsistent with that of '46.

To break a sentence in two, use a part of it, and then reject the rest, equally important to its full meaning, is a method resorted to only by the unscrupulous. All triumphs gained by such ignoble means are sure to be short-lived. By this mode of pseudo-reasoning one could prove almost anything. Had he published my article of '47 entire, he would have shown that it conformed with that of '46; but he did not start out with any such purpose. Had he even quoted the following from the same article, a few sentences beyond, the harmony between the two would have been apparent:

"The word *decompose*, as well as decay, admits of several significations, and can be *tortured* into many; but I wish to be understood as using it in view of the circumstances, in the light of common-sense, and in a comparative and qualified degree. Starting at a point at which its action is imperceptible, it passes down, step by step, one degree after another, until its operation is complete. The very term denotes *progressive action*, as it is, indeed, a chemical

action; so that the idea of disintegration is wholly incompatible with the premises."

Take this in connection with "I did not intend to be understood as advocating the propriety of leaving *actual* decay or *decomposed* matter in the tooth; *I mean, in the strict sense of the term*," and where is the inconsistency?

After the publication of my article of 1846, I was accused of leaving disintegrated, degenerated, rotten, and nasty decay in the teeth; hence, I used the term *disintegrated* to cover that general class. I might in the present light of science, perhaps, have advocated the leaving of "*disintegrated* dentine" in the tooth immediately over the nerve; provided I had properly prepared the margins of the cavity, and hermetically sealed it. Witness, in the August number, 1881, of the DENTAL COSMOS, my referring to a tooth I filled with amalgam in 1844, over very soft decay, upon removing which, in 1848, I found the once soft decay exceedingly hard and flint-like when cut, leaving a bright glittering surface, which I attributed to *fossilization* by the oxides of the amalgam. Asking Prof. Heitzmann if it were fossilization, he said it could not have been, it could only have been recalcification.

We all know that dentine may be deprived of its lime-salts and become decalcified, so that nothing but the gelatin remains. Make a thin section of this, place it under the microscope, and there you will find the tubuli and canaliculi as perfect as though it had never lost any portion of its lime. Theory and practice have established the fact ever since 1846, that all such dentine overlying a living nerve is capable of recalcification.

The terms decay and decompose are convertible. You can follow the whole series of retrogression from normality down through all the stages of degeneration to putrescence, and yet there will be decay and decomposition at every step from one extreme to the other.

My articles of '46 and '47 are in harmony with each other; in no sense does the last nullify the first; nothing but quibbling, perverse statement, and garbling of facts can make them seem otherwise. Dr. Flagg's characteristic system of perversion and withholding the whole truth by giving a part and leaving out that which makes the context in order to gain a point, is no "new departure" to him; it is the same old familiar way. He ignores the facts of history, and denies the incontrovertible testimony of printer's ink.

The record of '46 stands. No amount of ridicule can militate against it or put it out of existence. It has been attested to by scores, familiar to and authority in our profession, who have practiced its methods, some as early as 1844, and down to the present time. Since Dr. F.'s attack on me, I have received letters from dis-

tinguished members of our profession, stating that they have practiced the methods as laid down in my articles of '46 and '47, from that date to the present time.

How is Dr. F. going to annihilate all of these facts. He would undoubtedly do so if he could, and do it *regardless;* but fortunately there is a limit to even his ability.

He assumes that after my article of 1847 every thing going before was annulled: all that existed had not only ceased to exist, but never had existed; that all acts and operations referred to in my article of '46, were no acts and no operations; every thing had been done away with, and no discovery made; all practice in that direction had ceased, and all was *nil* till 1851, when the world commenced anew in the matter.

In reference to taking "wind out of the sails" of Dr. Arthur, or doing anything to his injury, I think it is a sufficient refutation to any such charge to say that my relations with Dr. Arthur were always, up to the time of his death, of the most friendly and genial nature. Those who knew Dr. Arthur's sensitive and chivalrous character, know that such familiar and confidential relations could not have existed, had he felt for a moment that he had been in any way injured by me. If Dr. Arthur did not feel aggrieved, why should Dr. Flagg? It is all as unreal as the mythical persecutors of Dr. Arthur born of Dr. Flagg's fancy.

Dr. Flagg implies that I have waited until after Dr. Arthur's death, before I ventured to revive my claim to precedence over him in this matter. This is as untrue as it is malevolent, for nothing was stated in the DENTAL COSMOS for August, 1881 (the record of the proceedings of the New York Odontological Society) that was not published years ago—in 1852—and which Dr. Arthur knew all about and accepted at the time, and told me so, stating that he was not aware that I had published my new doctrine so long before him, and that now he should discontinue his articles on the subject; *which he did.* From that day until his death, *he never published a word on the subject.*

I respectfully ask any one who may read this, to go to his file of the DENTAL COSMOS, and take the February number, 1881; turn to page 69, and read my report as chairman of a committee appointed by the New York Odontological Society, to express their sentiments upon the death of Dr. Arthur. The report is entirely my own. Indeed, I was informed that I was especially selected as chairman of that committee, for the reason that it was well known that the friendship existing between Dr. Arthur and myself had always been of the most cordial and intimate nature. I am willing that that record of my estimate of Dr. Arthur should stand for all time.

That portion of Dr. Flagg's article which refers to Dr. Arthur's persecution by the faculty of the Philadelphia College of Dental Surgery, has been entirely disposed of by Dr. Buckingham's recent articles in the DENTAL COSMOS, which show conclusively that no such persecution ever occurred.

W. H. DWINELLE, D. D. S.

PROCEEDINGS OF DENTAL SOCIETIES.

AMERICAN DENTAL ASSOCIATION—TWENTY-FIRST ANNUAL SESSION.

FOURTH DAY.—*Morning Session.*

DR. JOSEPH R. BUCHANAN, New York, addressed the association on the subject of the relations of the teeth to the emotional nervous system, illustrating his remarks by diagrams on the blackboard.

The discussion of the papers presented by the section on Artificial Dentistry, Chemistry, and Metallurgy was passed, and Section II., Dental Education, was called.

In the absence of the chairman, Dr. Fillebrown, a brief report was read by Dr. Crouse, submitting papers by Drs. Atkinson, Fillebrown, and Brophy.

Dr. Atkinson's paper stated that much time and some earnest effort had been spent in the endeavor to secure the recognition of dentistry as a specialty of medicine, and a disposition is apparent to reconsider the decision arrived at when Harris and his confréres made their attempt. Sections on dentistry have been formed in the International Medical Congress and the American Medical Association. Dental departments have been established in several well-known universities. Just as soon as it is recognized that no one body pursuing a special activity can possibly do the work of another, there will be less of unfraternity of feeling and action. We should inquire *how* we differ rather than *why*. As soon as it is seen that there must of necessity be different stand-points from which to view the matter, we should attempt to view it from both sides. Those who seek the recognition of others, do so under the apprehension that the others have something to give that is worthy to be acquired. It is pertinent to inquire as to the special recognition that medicine has to bestow on dentistry, and as to the fitness of dentistry to appropriate it to the advantage of those in need of dental services; and some well-defined standard of qualifications as a guide by which to bestow that recognition is necessary. Recognition to be effectual must be mutual, and that it may be mutual, each party should be so trained as to be tolerable judges of the qualifications

of the other. Inasmuch as such training has not yet obtained among medical men so as to make their instructions a tolerably unitary code of teaching, is it a marvel that dentistry is not yet crystallized into a well-defined and demonstrative single code of teaching? Dentists know quite as much of what medical men proper ought to know to qualify them to judge cases, as medical men know of what dentists ought to know. A mutual acknowledgment of each other as alternately adviser and receiver of advice, will tend to good results. A stilted assumption of superiority on either side does not tend to bring out the best knowledge in the possession of either in consultation. The domination of strong will in the leader in any consultation, does not tend to enlightenment so much as patient presentment of what is apparent on examination. Union is the product of a necessity felt; a growth and not a manufacture. Suppose some representative of the medical fraternity should refuse to recognize dentists as part and parcel of the body of healers—would that exclude them from usefulness to those whom they now serve to their great benefit? Let us be so grounded in a knowledge of principles as to honestly recognize ourselves as fit to offer our services to the community; then patiently and quietly await the outside recognition, which is sure to come just so soon as those not of us become competent to judge of the qualification that demands and commands recognition by reason of its worth. Real capacity never seeks for recognition, nor does it reject it where it is legitimate.

Dr. Fillebrown's paper which was read by Dr. Browne, stated that it seemed that no further proof is needed to convince thinking men that higher culture and more thorough training are essential to the best interests of the profession. Professional and public opinion has set strongly in favor of a broader medical education for dental practitioners, and the growing interest of the medical fraternity in dentistry is evidenced by the formation of sections for its discussion in the International Medical Congress and the American Medical Association. The power of the influence of the medical profession on the public mind for or against a better education for dentists will be seen to be very great when it is considered that in this country the physicians outnumber the dentists more than six to one. The advance in requirements for dental graduates, owing to the many conflicting interests, has not been marked during the year. Some effort has been made in a number of the schools to introduce preparatory examinations, with the effect of familiarizing to some extent students and preceptors with the plan, but until it becomes general in its application, no great results can be expected. In this regard the medical profession is no better off than dentistry.

One of the first medical colleges that tried the plan was compelled to relinquish it because of the falling off in the number of matriculates. It is therefore reasonable that this association be moderate in its demands upon our own special institutions. Here and there the plan of preliminary examinations has been adopted and adhered to in both medical and dental schools with good results. It is for the members of this association to endeavor to create and strengthen a sentiment that will enable all the others to make the same demand. A better class of students must be furnished. The only way of shutting out the ignorant and inefficient is to insist upon a thorough preliminary examination. Private pupilage is another great evil in our system. Three years spent in a good school will give the student opportunity for constant and rapid improvement in place of the fragmentary knowledge he would gain under a private preceptor. Private preceptorship may very well suffice for the purely mechanical operations, including the filling of a tooth.

The moment the profession as a body takes the stand herein indicated marks the dawn of a new epoch in dental education. Then the schools with their increased patronage can fix and maintain a higher standard of matriculation, and will be encouraged to increase their facilities and excellence in teaching. It lies within the power of this association to-day to awaken a sentiment that will rapidly increase, and before very many years make private preceptorship a thing of the past.

Dr. T. W. Brophy, Chicago, in his paper, advocated the disbarment by law in every State of incompetent men from practice. The standard of dentistry is advancing much faster in States where there are laws for its governance; where there are none, its progress is very slow. So long as any man may begin practice, even though ignorant of primary principles, so long we shall have our most formidable opponents to scientific advancement within our own ranks. Dr. Brophy advocated preliminary examinations for intending matriculates, at least in English branches; it were much more desirable that a classical education should be insisted on. Lack of training embarrasses every step of personal advancement, and of professional or social intercourse. It must be admitted that the time when the test of preliminary education of the student should be enforced is at the beginning of his professional studies. First, because the mental discipline and knowledge resulting are necessary to fit him to prosecute his studies with facility; and second, because it would be manifestly unjust to reject him at the final examination for lack of acquirements, which he should have possessed before he matriculated. It is gratifying to know

that some of the dental colleges are insisting on preliminary examinations, and it is to be hoped that this example will be adopted in all.

If "dentistry is a specialty in medical science," it is impossible that it be a profession in itself. If dentistry is a specialty of medicine, every dentist is or should be a medical man.

The essayist favored the divorce of mechanical from operative dentistry, because they are as incompatible as operative surgery and the manufacture of surgical appliances. The mechanical dentist should possess artistic mechanical skill; should be well versed in the chemistry of the metals; have a thorough knowledge of the anatomy of the muscles of expression; be thoroughly instructed in the manipulation of the materials of which artificial dentures are constructed, and be able to select and arrange artificial teeth in imitation of nature's forms. It is not or should not be within his province to treat oral diseases—not even the diseases of the teeth. He does not require a knowledge of the principles and practice of medicine, a knowledge which is really essential to the successful pursuit of operative dentistry. Mechanical dentistry is so high an art that it is absolutely impossible for the student to gain a proper knowledge of this and of the operative department in the time required by the dental colleges. Students who propose to practice in cities should elect to practice exclusively one or the other. If their practice is to be in the country, they should of course be able to construct artificial dentures. The cause of dental education would be advanced if the study of mechanical dentistry were not compulsory, and the time now devoted to it were spent in medical studies. All who aim to practice operative dentistry should receive a full medical education, the same as other specialists. Those who aim to be mechanical dentists should devote themselves to this department, and when found qualified, should receive a certificate to that effect. Dental surgery, properly practiced, is a specialty in medical science, and should be taught as other specialties are in medical colleges. Had Harris been successful in establishing dental chairs in the medical schools there would have been no dental colleges. When the first dental college was established it had but four professors, all medical men. Chemistry, microscopical anatomy, histology, materia medica, and surgery were not included in the curriculum, but as the demand for a larger knowledge grew, these and other branches of study were added, until now many of our profession believe that dentistry should be taught in the medical schools. If mechanical dentistry is not made compulsory, the medical schools by adding efficient instruction in the principles and practice of dental surgery, will be far better adapted to the instruction of the dental student than the dental colleges as now orga-

nized. Let the dental student take a full three-years' course in medicine; let him attend all the lectures, and while those who propose to pursue a general practice or some other specialty, are receiving instruction in their departments, let him be present in the dental infirmary, receiving practical lessons under the guidance of efficient demonstrators. Then when he comes up for examination, he will, if qualified, receive the degree M. D., which is sufficiently broad to cover every department of the healing art. As other students receive certificates from special instructors, so should he who has qualified to practice the specialty of dental surgery.

Dr. Litch. The leading thought in Dr. Brophy's paper seems to be that the dental colleges as such should be abolished, and dental education be sought for in the medical schools. While he agreed with the writer of the paper that the ideal education for the dentist is a thorough medical education as a foundation for special instruction in dentistry, he could hardly admit that just at present it is attainable, and he furthermore disagreed with him in the assumption that the best of the dental colleges do not very well qualify the dental practitioner for his special work. These have chairs of anatomy, physiology, general chemistry, and materia medica, which are the fundamental branches of medical science. We all recognize the fact that while it is important that the dentist should understand the principles which underlie general diseases and their treatment, a thorough knowledge of the details of such treatment or of the details of the practice of general surgery is not essential. If he knows the details fully, it is helpful—perhaps desirable—but not any more necessary than it is for the medical practitioner to have a knowledge of the dental specialty. The experience of the gentleman who stated in a paper read a year ago, that in a three-years' course in a medical college he had failed to hear one respectful reference to dentistry or dental pathology, would he thought be found to have been the experience of every dentist who had graduated in medicine, as it had been the speaker's. One need but turn over the pages of the medical text-books to see how very meager is their information in regard to dental pathology and therapeutics. In the medical text-book on the materia medica, you will find in the whole list but two or three allusions to the use of drugs in dentistry. Dental surgery is as entirely ignored as though there was no such thing as a tooth. The medical course, as at present arranged, cannot be said to give the proper training for the dental student, because the course is built up for the education of medical practitioners and not of dental practitioners. Until a little more progress is made by the medical profession in recognition of the claim of dentistry to be ranked as a legitimate branch of scientific medicine, it is better not

to abandon the old schools which have done so much towards advancing dentistry to the standard it now occupies. He held preliminary examination to be desirable, but it is not required in the majority of the medical schools, and until it is so required, dental schools can hardly be expected to set up a higher standard. A classical education is desirable because nomenclature is based on the classical languages, but it is not essential. With an ordinary good English education, a very fair amount of progress can be made. While the separation of the mechanical and operative branches may be desirable, it will be found impossible of attainment, as a rule. It answers very well for the large cities, but the average practitioner must be a general practitioner in order to meet the requirements of his patients and secure a livelihood. A higher degree of skill in either branch can of course be attained by exclusive devotion to that branch; but the average man can do good work in both. The speaker repudiated the suggestion that there is anything derogatory in either or both, or in one more than the other.

One of the most potent influences we can have recourse to for securing the advance of dentistry is the passage of laws for its regulation, but the securing of intelligent legislation on the subject is a matter of immense difficulty. Legislatures have to be organized in the interest of such bills with almost as much care as in the interest of a corporation. There is, too, great difficulty in enforcing legislation when obtained, owing to laxness of public opinion. In Pennsylvania the committee appointed for the purpose, brought two or three suits—the plainest and most palpable cases of infringement—and verdicts were brought in for the defendants in spite of the law and the evidence and the charge of the judge.

Dr. L. D. Shepard. Those who have been for years engaged in the education of young men for professional duties, know the difficulties in the way of proper training better than those on the outside. The chief difficulty is, because up to the present time the great majority of students cannot afford to spend a long time in professional study. But few, comparatively, with a classical education and ample means, take up the study of dentistry. A very small proportion of those who enter the colleges are willing to spend an extended time in study. They seek as a rule the shortest course, that which will enable them to engage in the active duties of professional life in the shortest time. Then, again, but a very small proportion, less than five per cent., have the means to carry them through an expensive course. The second objection is that by no method yet devised, can you crowd into a three-years' course more than the student is capable of receiving. If the study of medicine takes three years, it is true that you cannot crowd into the

course another profession which is going to require time. The student cannot become perfect in his medical studies and keep up in the special dental studies and acquire the practical handicraft necessary to practice dentistry. To the time required for the medical studies must be added another year at least. In our school we have demonstrated that the dental student who studies with the medical students, if any of his time is taken up during the first year acquiring practical skill, is not competent to pass the same examination. We have to require them not to enter the dental laboratory during the first year. He would favor the idea advocated in the second paper, (Dr. Fillebrown's) if this plan were adopted; but the student must devote the three years to medicine, without having a good part of the time taken up in the practical studies of dentistry, and then let him spend an additional year acquiring manual dexterity. Other specialists have to supplement their general medical studies with special studies before they are ready to enter upon practice.

Dr. C. S. Stockton believed that the higher the education of the dentist, the better will be his qualifications. Were he a young man about to study dentistry, he should do so with a medical education as the foundation, because it would inspire better confidence in his ability among the community.

Dr. G. F. Waters thought that no one afflicted with color-blindness should be a dentist. He would have intending students examined with reference to it, and any who have it, he should advise to seek some other calling.

Dr. Brophy asked Dr. Litch's definition of dentistry.

Dr. Litch. The art and science of treating pathological conditions of the teeth.

Dr. Brophy. Then artificial dentistry is not a part of dentistry. Then physiology, therapeutics, and the materia medica have nothing to do with dentistry. Then the time has not come to teach dentistry in the medical schools. We do not make medical specialists in the schools; we just give medical students the foundation whereon to build, and that is what we want to do with dental students. It is just as proper that dental practitioners should have special training after passing through the college as that other specialists should.

Dr. Hunter, Battle Creek, Michigan, thought it might be well if we could examine students as to their possession of the natural faculties necessary to success in dentistry, and if they do not have them in sufficient degree for development, they should not be accepted. The great difficulty was in taking students lacking the mental faculties for the proper pursuit of dentistry, or who had not integrity or honesty of purpose enough.

Dr. Shepard said his idea was that every medical school should have as thorough a course in dentistry as in the eye, ear or skin department, and that it should insist on as complete an examination. Then when the student has passed this, he should go to the hospital for his specialty, to pursue his special studies. He made the point that dental schools which advertised that graduates could get the degree, M. D., after one year's additional study, cheapen the medical degree, and this body should condemn the practice. The degree, M. D., which properly requires five years for its acquirement, if granted in three years is not a real degree, and the man who takes it takes what is false.

Dr. C. R. Butler. The day is past when there is any need of endeavoring to bring men into the profession by the short cut, on the plea that they cannot spend the necessary time in preparation. It would be a poor argument to let a man set up for a harness-maker or a machinist after two years' service, when three is the shortest period, because he has not any more time to devote to it. There is no demand that encourages any such method. The great mistake is in the preceptor for any reason encouraging young men who have no aptitude.

Dr. Litch, in reply to Dr. Brophy, said he believed that the definition he (Dr. Litch) had given of dentistry was a perfectly good one; that the insertion of an artificial denture should be deemed a method of treating a pathological condition of the teeth, and had its place somewhere within the definition. There is quite a large class of cases in which it is one of the best, and often the only means of treatment; as, for example, in cases of abrasion arising from excessive use, caused by the loss of contiguous teeth. The so-called operative treatment would probably be to undercut and cap the crowns with gold. The so-called mechanical method would be the insertion of an artificial denture to supply the place of the lost organs. Both are methods of treating pathological conditions, though why one should be called operative and the other mechanical was hard to explain.

Dr. Atkinson. The great mischief lies in the conferring of degrees. There never was an honest M.D. or D.D.S. conferred. If a certificate of advancement were given in its stead, it would be all well enough. The next error is in rating all men as of equal capacity, and saying that a certain number of hours spent in study will make them all equally competent.

Dr. Frank Abbott would impose in addition to a severe examination at the end of pupilage, a preliminary examination, to be a test of the fitness of the applicant to become a student. He had just received a letter from a young man with reference to entering a

dental college, and he would in his answer suggest that he go to school a while first. He would examine if he had only ten men in the class. It was high time this association took some decided stand in this matter. The colleges may require enough in the way of tests from the students when they go out, but their rules are not stringent enough with regard to the general education of students. He would require a written preliminary examination, and this was the only time when it can be told whether students have the necessary qualifications. If some such requirement were insisted on, it would be a great step in advance.

Dr. Buckingham wished to correct some of the assertions that had been made. It is not true that dental faculties graduate students for the sake of getting their money. There is no inducement to do so, because the student pays his money when he enters and it is not returned to him if he fails to pass. He thought that the colleges were doing the best they could under the circumstances; if more dentists would visit them while in session and learn more about them there would be less said against them at these meetings. Their curriculum of study and their facilities for teaching are better than can be adopted by any private preceptor. When a student graduates we certify that he is competent to practice dentistry. We do not say he is perfect. If the best student of any college were to close his books when he graduated and stop studying, he would not be much of a scholar in a short time. All that is done in the college is to teach the student principles and let him put them in practice after he has graduated. We think dental colleges should teach all that is required in the ordinary practice of dentistry, and we are therefore in favor of having our own colleges and not medical colleges with dental departments. We know very well that the practice of medicine and the practice of dentistry overlap each other, but the general practice is very far apart. The physician depends upon his medicine stimulating and assisting nature to perform a cure, while the dentist expects his work to prevent further progress of the disease. As prevention is different from cure so we think the teaching should differ. The student should first learn that which is essential to his practice, and then if he has time and capacity he can add to it. The physician or surgeon requires a minute knowledge of the anatomy of the whole system, and if well informed he will have a general knowledge of the teeth and their diseases. The dentist must know the teeth and the parts surrounding them, and need have only a general knowledge of the remaining parts. The physician requires a full comprehension of all the medicines; the dentist of only a few, most of his treatments being mechanical. This comparison may be extended indefinitely, but

enough has been said to show that while medicine and dentistry run partly in the same track, the requirements of practice are very different.

The dental departments of medical colleges do not require the student to take the full course. In Harvard and the University of Pennsylvania the dental student attends the first course of the medical lectures, and the course is graduated for three years, in which the instruction of each is different. Now, is it not better to have in the dental colleges teachers well acquainted with medical science to select the subjects which apply to dentistry, and condense and place them in proper form. In this way the whole science of medicine can be gone over without cramming the student with matter which may be of great value to the medical practitioner, but is of little use to the dentist. Or why do not those who claim that dentistry is a specialty of medicine require the dental student to take the whole course in medicine, as other specialists do? He did not object to the dentist's graduating in medicine, but he did claim that dentists could practice dentistry scientifically without such a degree.

The subject was passed.

Dr. Crouse offered the following resolutions, which were adopted:

Resolved, That hereafter no society shall be entitled to representation in this association that does not require its members to live up to the requirements of our Code of Ethics.

Resolved, When it comes to the knowledge of the Committee on Credentials that any applicant for membership is violating our Code, said applicant shall not be received; and all such applicants shall be referred by the committee to the societies whose delegates they are; and in no case shall this association be compelled to treat with violations of the Code of Ethics, except where the violator is a member of this body, and has no membership in any local society.

Dr. L. D. Shepard offered the following amendment to the Constitution:

Amend Article IV. by adding a section, as follows:

SECTION 2. The officers may, for extraordinary reasons, change the time and place of meeting upon the written consent of ten (10) of the fifteen (15) officers.

The new president, Dr. H. A. Smith, was installed; and after the passage of the usual resolutions of thanks, the association adjourned to meet in Cincinnati, the first Tuesday in August, 1882.

NEW YORK ODONTOLOGICAL SOCIETY.

REGULAR meeting held October 18, 1881, at the rooms of The S. S. White Dental Manufacturing Co.

President Bronson in the chair.

Dr. S. G. Perry. Dr. R. S. Tracy, a practicing physician of this

city, very justly believes that many teeth are injured by the use of stiff tooth-brushes. He has handed me for exhibition before this society a little device which he thinks may be an aid to those who like to take nice care of their teeth. It can be used without endangering the gums. It consists of a metallic holder so made as to carry a little block of felt, which, being wet and dipped in tooth powder, can be rubbed over the surfaces of the teeth. The blocks are cut of uniform size, a little over a quarter of an inch square. They can be supplied cheaply, a new one being used for each cleansing operation. They are quickly and easily put in and taken out of the holder. He does not expect them to take the place of the tooth-brush entirely, but considers them as a supplement to it, particularly for the surfaces of the front teeth.

Dr. W. H. Dwinelle. My opinion is that it can be of no very great value. It is very much like the practice of rubbing the teeth with a towel, which has been practiced since towels have been known.

Prof. Louis Elsberg, M.D., then addressed the society on the subject of the Electrical Illumination and Cautery of the Mouth.

Mr. President and Gentlemen:

In response to your invitation I shall endeavor to make you acquainted with the subject of electrical illumination and cautery in the mouth. I want to explain in the first place what electricity really is; and I should like to ask each one of you to consider the question, "What is electricity?" addressed to himself personally, and try to formulate an answer. Formerly, in fact until quite recently, electricity was supposed to be some sort of matter, a something that does not have any weight, an imponderable; but at all events, a material something. Perhaps even at this day the question "What is electricity?" would be answered differently by different individuals. What I personally think that it is, I published a good many years ago, and can repeat in a very few words. I think that electricity is not a material at all, but that it is a mode of motion of the material; it is a mode of motion of the particles or molecules of any matter, and it is a particular kind of motion, namely, a to and fro motion; a motion backward and forward, upward and downward, —what is called a vibratory motion. It is known that vibratory motion constitutes others of what heretofore were called forces of nature. We know, for instance, that when any matter, any mass of matter, vibrates or makes motions backward and forward a certain number of times—not less than 16 times in a second and not more than 38,000—we know that that vibration strikes our ears as a sound. I believe, and so published ten or twelve years ago, that when the particles of matter vibrate not less than 40,000 times in a second, and

not more than 65,000,000,000,000 times in a second,—I believe this vibration constitutes electricity. I am not aware how many or how few scientific men at the present time are of the same opinion, because I have been engaged of late in other matters, and have not kept up with the literature of the subject during the last ten years. At all events it is very well known to you that when vibrations occur oftener than between 65,000,000,000,000 and 400,000,000,000,000 times in a second, the effects of these vibrations are brought to our consciousness as heat, while when they go over 400,000,000,000,000 in a second in frequency, i.e., between this and 800,000,000,000,000 per second of time, we recognize them as light, and beyond that as chemical effects, etc. It is also well enough known, as to many of these vibrations, that their rate of vibration can be altered by being propagated through certain media. If we succeed in altering the rate of vibration we change the effect. Thus, for instance, we know of some vibrations beyond the ultra-violet color in the spectrum, which are invisible to the human eye because their rate of vibration is greater than 800,000,000,000,000 in a second, that they can be slackened in their rate by being passed through a solution of sulphate of quinia, and thus can be made to occur so much slower that they affect our eyes and show a peculiar bluish color. This has been observed for many years and is known as a very interesting phenomenon, —the so-called fluorescence. I might instance other cases of transformation of the rate of vibration and of thus converting the so-called forces to which they give rise, but my object will be attained if, by referring to this subject of the convertibility of vibrations, I facilitate your understanding of the suggestions which I shall make as to how electricity is correlated and can be converted into heat and light.

It has been ascertained that the velocity of electricity is a good deal less than that of heat and light. That statement is one of many which I shall make in a few minutes, the opposite of which you will find in a good many text-books which have been published previous to twelve or twenty years ago. It is there usually stated that the velocity of electricity is 200,000 or 300,000 miles in a second, but all the recent experiments have shown that it is not anything like as fast as light, and we know heat travels at a rate a little less than that of light, which latter is 190,000 miles in a second. I personally have no doubt that electricity-vibrations are propagated by progressive wave motion, and that as in the cases of sound and heat and light this propagation requires some material substance —some substance the particles of which take up and transmit the vibratory motion.

Substances differ very much as to their facility of propagating or,

as it is popularly called, conducting electricity; in other words, some offer greater resistance to what I believe to be wave-propagation, or, as it is called, the passage of the electrical current. Those substances which offer the most resistance and are therefore the worst conductors, are called non-conductors or insulators, because they are used as surroundings for electrical bodies when it is desired to prevent the electricity from being propagated away; such non-conductors are gutta-percha, etc. Of course the truth is that no substance insulates perfectly, and the electricity of every electrified body is lost more or less rapidly. Glass is a very bad conductor, unless moisture condenses upon it. Among conductors, charcoal offers more resistance than the metals, and of the metals the following show a relatively decreasing electrical conductivity, or what is the same thing relatively increasing resistance to its propagation, viz.:—silver, copper, gold, zinc, platinum, iron, lead, German-silver. It appears from this that silver is the very best, and German-silver, of the list I have quoted, the very worst conductor of electricity. I would state though, that copper being a better conductor than any other metal except silver, is the metal that is used almost always in our electrical apparatus for conducting electricity, on account of its greater cheapness than silver; while for conducting electricity for telegraphing, iron may be used, although that requires five or six times as much substance, because it is a five or six times worse conductor; yet on account of its cheapness, it is cheaper even with the five or six times larger amount required than the needful length and thickness of copper would be. On the other hand for interposing an artificial resistance in the electrical instrument, which, as you will see further on, is sometimes of extreme importance, and the absence of which may, indeed, prevent me from showing the illumination this evening as thoroughly as I want to,—for interposing an artificial resistance, we use German-silver rather than any other metal. You know that if you apply increasing temperature to a metal, the vibrations of the particles which constitute heat become, under certain circumstances, so much increased in rapidity, so much accelerated in rate, that they impress our consciousness as light. Similarly, the vibrations of electricity, propagated under certain circumstances through metallic wires, become so much accelerated that they impress our consciousness as heat. I suppose all of you know that when to each of the plates of the galvanic battery a good conductor, such as a copper wire is attached, on bringing the ends of the two wires together, we get a spark; so much heat is evolved that we have a little light, but if a relatively bad conductor, as a platinum wire, is interposed between the two ends of the copper wires, the rate of the electrical vibrations is so much increased, that

the platinum becomes very hot. The heat increases under favorable conditions so much as to cause incandescence and even fusion; indeed, with a sufficiently powerful battery, any metal can be melted.

For medical purposes of electrical cautery and illumination, platinum is especially adapted because it is not easily fused, not liable to rust, not brittle; because a thin wire is strong, and because of its low specific heat, on account of which, the same amount of heat raises it to a higher temperature than a wire of greater specific heat. Galvanic cauterization seems first to have been performed about fifty years ago, in 1830 or '31, by Pravas, of Alfort, and Palaprat, of Paris; since then, others have used and recommended it, especially Heidler, of Vienna, Crusell, of St. Petersburgh, and John Marshall, of London; but the merit of introducing it into surgery, belongs entirely to Middeldorpf, of Breslau, in 1854. Nobody seems to have thought of making use of the light of incandescent platinum for illuminating the cavities of the body previous to 1867. In that year, Dr. Bruck, a Breslau dentist, constructed an instrument which he called a stomatoscope; Millot, of Paris, published in the same year, his successful experiments on cats and dogs. In 1868, Lazarevitch, of Charkow, applied the electric light, and in 1868, also, I made use of it in connection with Dr. Budd, of this city. But it was not until 1870, when Trouvé took up the problem that it was satisfactorily solved. The point I want to call your attention to is that while a surgeon of Breslau introduced the medical galvanic cautery, it was a dentist of the same town who was the first to apply the electric light for the illumination of any cavity of the human body.

For a knowledge of the conditions which regulate the action of galvanic currents, science is indebted to the late Professor Ohm. He formulated the celebrated law which bears his name, that "the intensity of the current is equal to the electro-motive force, divided by the resistance," or, as I have paraphrased it, the effectiveness equals the production of electricity divided by the resistance. Ohm's law may be expressed by the simple formula, $E=\frac{P}{R}$, E being the effectiveness, P standing for production or electro-motive force, and R for resistance. The so-called electro-motive force, P, depends upon the nature and condition of the metals, and the nature and degree of concentration of the liquid in which they are immersed; it is the greater, the greater the difference between the chemical action which the liquid exerts upon the two metals immersed. It is greater between zinc and platinum immersed in dilute sulphuric acid, than between zinc and iron, or zinc and copper. The resistance, R, depends upon three factors, viz.: the conductivity of the conductor, its section, and its length. I have already stated that

the resistance offered to the propagation of electricity varies greatly in different substances, *i. e.*, that the conductive power of substances varies; the less the conducting power of course the greater is the resistance. This is a constant, determinable for each conductor. Then the resistance is inversely as the section, and directly as the length of the conductor.

In an ordinary element there are essentially two resistances to be considered, viz.: 1, that offered to the conduction of electricity by the contents of the element, *i. e.*, the liquid between the two plates; and 2, that offered to the conduction by all the substances included in the circuit connecting the two plates. The first is called the internal or intra-elemental resistance; the second, the external or extra-elemental, or interpolar resistance. Designating the former by R, and the latter by R′, Ohm's formula becomes

$$E = \frac{P}{R + R'}.$$

If any number, n, of similar elements are joined together, there are n times the electro-motive force, but at the same time n times the internal resistance, and the formula becomes

$$E = \frac{n\,P}{n\,R + R'}.$$

If the external resistance is very small, which is the case, for instance, when a very short and thick copper wire connects the plates, the value of R′ may be neglected in comparison with the internal resistance, and we get

$$E = \frac{n\,P}{n\,R} = \frac{P}{R};$$

that is, a battery consisting of several elements produces, in this case, no greater effect than a single element. If, on the contrary, the external resistance, R′, is very great, which is the case where the current has to pass through a long thin wire or through a liquid, the effect is within certain limits very nearly proportioned to the number of elements.

If the plates of an element be made l times as large, there is no increase in the electro-motive force, for this depends upon the nature of the metals and of the liquid, but the intra-elemental resistance is l times as small, for the section is l times larger; the formula then becomes

$$E = \frac{P}{\frac{R}{l} + R'} = \frac{l\,P}{R + l\,R'}.$$

Hence, we cannot increase the effect to an indefinite extent by increasing the size of the plate, for ultimately the intra-elemental resistance, R, vanishes in comparison with the interpolar resistance,

R', and the formula approximates to $\frac{P}{R'}$, that is, the effect is inversely nearly as the interpolar resistance, the length of the connecting wire, irrespective of the increased size of the plates.

I have cited these illustrations from "Ganot's Physics,"* and they are sufficient for my purpose.

It is very necessary, gentlemen, for all of us to have clear ideas in this matter of intra-elemental and interpolar resistance. I have said so much of the way in which electricity is propagated, that you will readily understand that much depends upon the conveyance of the electricity from the plates which give rise to it through the liquid and the electrodes to the point where we want to use it. It has been ascertained in accordance with the law which I have just given, Ohm's, and also practically by trying different arrangements of the elements of various batteries, that the maximum effect in any given combination is obtained when the total internal resistance is equal to the total external resistance. This is so plain and easy to understand, that any one of you should be able to follow me perfectly. In such a case no motion is lost in the conveyance from the origin to the point at which you want to use it.

I have said before, and given the reasons why, platinum is the best metal for galvanic cautery and illuminating purposes. Now, although the platinum wire that is used for this purpose offers a good deal of resistance to electrical waves as compared to silver or copper, it offers only very little resistance as compared with water, with the epidermis, or the human body generally. Hence, for heating the platinum, we must, in order to obtain the best results from the elements at our disposal, diminish the internal resistance more than is required for any other purpose in electro-therapeutics. This diminution is accomplished by arranging the elements so as to have a comparatively small number of plates with a comparatively extensive surface of chemical action. A battery thus arranged is called a battery "for quantity," while one arranged in a series of a large number of separate cells is called a battery "for intensity;" but what I want to impress upon you as scientific men is, that the terms quantity and intensity, as applied to electricity, have arisen from the erroneous conception of the nature of electricity that was in vogue in times past, viz.: that it is a peculiar fluid matter, and that therefore you can speak of its quantity. The difference in the effects of batteries thus differently arranged, is due entirely to the difference in the intra-elemental and interpolar resistence which is brought about.

The main reason why galvanic cautery is not more practiced by

*1. Translated by E. Atkinson, New York, 1872, pp. 653 and 654.

physicians and dentists, lies unquestionably in the inconvenience and difficulties and disappointment attending upon the employment of all the galvanic batteries heretofore used for this purpose. As the intra-elemental resistance requires to be small, we have had to use either an inconstant battery, *i. e.*, one with only one liquid interposed between the two plates, which, in spite of all sorts of devices, is objectionable on account of its polarization and inconstancy, or else we are compelled to use a constant battery, requiring strong acids, in which the chemical action is great, which uses up our material very fast, is very expensive, and is very inconvenient, difficult, and unpleasant to use. In January, 1874, I stated in the *American Journal of Syphilography and Dermatology*, p. 15, that "the desideratum of a galvanic battery for cautery purposes entirely satisfactory is still unsupplied. By far the best I am acquainted with is Voltolini's (Middeldorpf's) carbon-zinc battery of two elements; and if it were not for its requiring two acids and a good deal of care, I should not desire a more convenient or efficient apparatus. Dr. Sass, of this city, is experimenting with a view to perfecting a new battery which is to obviate all objections." I stated that in '74; the hope then expressed as to Dr. Sass has not, I am sorry to say, been realized, but at that very time, Trouvé had begun to supply the desideratum in a very ingenious way.

It had long been known that the cause of the trouble with a battery with one liquid is the so-called polarization of the inactive plate; that is, the deposition on the surface of the plate of hydrogen, arising from the decomposition of the water of the liquid in which the plates are immersed. Experiments had shown that by taking a number of pairs of pieces of metal of the same kind, each pair being separated by a moist cloth, and each end of the system connected with the pole of a battery, a so-called "secondary battery" could be constructed; that is, the decomposition of the water with which the cloth is moistened, leads to the accumulation of oxygen and hydrogen on opposite plates of the circuit, and it is found that after some time, even if separated from the battery itself, the apparatus exhibits electrical effects due to the polarization. The cause of the enfeeblement and final cessation of action in the ordinary battery is the neutralization by the secondary or polarized current of the primary current, as it is called, and this very polarization had already been made use of by Gaston Planté, for producing a secondary battery in the manner above described. Now, it occurred to Trouvé that such a secondary battery might be used for galvanic illumination and cautery. He constructed one of appropriate dimensions, and found by connecting it a sufficiently long time with even a feeble battery, that it became capable of producing for a short

time a powerful effect in heating platinum. With this device we can make use of a battery in which but little chemical action goes on, and which, therefore, remains without material alteration for a considerable period of time. Those who have experienced the annoyances heretofore inseparable from cautery batteries, can appreciate the innovation. To charge the "secondary battery" or accumulator, we use a battery which gives no trouble, needs hardly any attention for six months or a year; and we can, by means of this "go-between," do work which heretofore required a battery which demanded constant attention and trouble.

I have here such an accumulator or secondary battery, as that which was devised by Trouvé, and which I have modified a little, and have had made in this city by Reynders & Co. No doubt you remember a good deal of newspaper talk about "storing electricity," in which it was claimed that the accumulator had been very much improved by Mr. Faure, of Paris. It is simply this: you take two pieces of sheet-lead and roll them one upon the other, with a strip of India-rubber or leather between them to keep them separate, and immerse these two rolls in some acidulated water. The only object in having the water acidulated is to make it easy for the electricity to be propagated through the liquid, because water is a very bad conductor, while sulphuric acid is a good one, and a ten per cent. solution of acid is a good conductor. Faure's improvement consists in covering this sheet-lead with red lead. I have not been able to test how much of an improvement that is. He claims that the so-called power of storing electricity is very much—50 or 100 times—increased by red lead. However, this simple apparatus, which any one can manufacture for himself in a homely way, and which you see here as made by Messrs. Reynders & Co., of this city, is amply sufficient for all your purposes.

The way in which the apparatus operates is very simple. When it is attached to a galvanic battery, the water in the glass jar in which the two rolls of lead are immersed is decomposed. The vessel is hermetically sealed, so that no water evaporates, and none of the two gases resulting from its decomposition escapes. One of the elements, the oxygen, goes to one of the plates of lead, and the other, the hydrogen, goes to the other; consequently, one of the plates is oxygenated or oxidized, while the other is covered with a film of hydrogen. When a large quantity of the water is thus decomposed, the box is, so to speak, "charged;" it may be carried from place to place, and potentially contains a quantity, so to speak, of electricity, which you can take out and use at your pleasure. When the electricity of such a charged machine is used up, the poles are again brought in contact with a battery, and the pro-

cess of "charging" is repeated. Thus, what heretofore has been so great an objection in all electrical apparatus, is the very thing here made use of; that is, there is a secondary current produced, and this secondary current is the electricity that is, as it were, stored up. When the two "charged" plates are connected, the hydrogen and oxygen reunite to form water, and with this chemical action electricity is evolved; consequently, in this air-tight vessel, where you just had oxygen and hydrogen confined, you have water again. The so-called "polarized current" which results from this recomposition of water, is sufficiently strong, when the machine is charged sufficiently, *i. e.*, when it has been in contact with a battery long enough to have decomposed water enough to cover one of the plates with a film of hydrogen and to blacken the other with the peroxide of lead, to produce the effects of cautery and illumination. When the leads are deoxidized and dehydrogenized, and you have used up the electricity, you, of course, have water again, and must recharge your box. Thus you have recomposition and decomposition of water, and charging and discharging the box, which may be said to contain electricity, exactly as though you were dealing with a material substance, which you could confine in a box and carry about with you and use at your pleasure. Of course, in point of fact, the box does not contain or "store" electricity at all; what it does contain is oxygen and hydrogen, in such form and under such circumstances that an electrical current can readily be obtained by their union.

But whether the "accumulator" box or any other galvanic battery be used for the purpose of heating platinum wire to incandescence, we are always in danger of having relatively thin wire fused. To obviate this danger, we interpose a rheostat. As is well known, a rheostat is an instrument by which the resistance of any given circuit can be increased or diminished without opening the circuit. I have already mentioned that for the interposition of an artificial resistance, thin wire of German-silver is very convenient; and I have also expressed the fear that the want of such an arrangement may interfere this evening with my showing you the illumination of the mouth and teeth as perfectly as I should like to. In the instrument for galvanic cautery which I shall first exhibit to you, there is less danger of fusion of the metal, because the wire is thicker.

[Experiments were then made with various galvano-cauters, which were heated to a brilliant white heat. Among others, those represented in Figs. 1 and 2 were shown.

Other instruments were then exhibited, and it was explained how in using a galvano-cautery wire-loop, after the manner of an écraseur, the danger of the melting of the wire is increased.

The construction of galvano-illuminating instruments was then explained by showing illuminators such as are represented in Figs. 3, 4, and 5.

FIG. 1.

FIG. 2.

FIG. 3.

Fig. 1 represents a pointed galvano-cauter.

Fig. 2 represents a flat galvano-cauter or galvano-knife.

Fig. 3 shows a short, thin platinum wire, *a*, hammered flat in the middle, which is fastened in a concave porcelain reflector. The illuminators as well as the cauters fit into handles, the construction of which was shown, and is represented in Figs. 4 and 6.

FIG. 4.

FIG. 5.

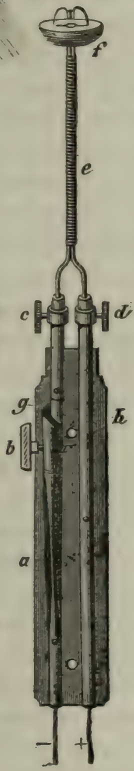
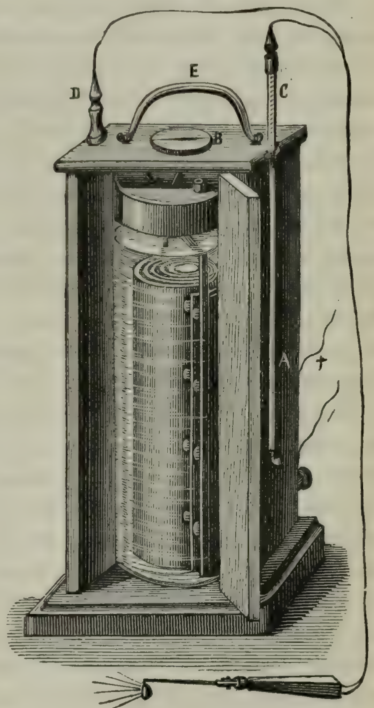


FIG. 6.



Figs. 4 and 5 show handles with illuminators attached. In Fig. 4 the handle is shown in full view; in Fig. 5 in section. The elec-

trode cords, marked + and —, are inserted into metallic cylinders, one of which, *a*, is cut at *g*, the connection being restored by pressing on the button, *b*. At *c* and *d* the illuminators or cauterizers are inserted and fastened by thumb-screws.

The accumulator-box was fully explained, and is shown in Fig. 6.

Fig. 6 shows the open accumulator-box. Inside is seen the jar with the rolled lead constituting the secondary battery. On the top of the box is a galvanometer, B, designed to indicate the activity of both the accumulator and the primary battery. It has a semicircular scale, with zero in the middle, divided into 90° on each side. The apparatus, before being connected with a galvanic battery, is so placed that the needle points to zero—exactly north and south. The deviation when the connection is established shows whether or not the battery is in working order. Trouvé advises that whenever the needle points to less than 30° the battery should be examined and any deficiency corrected. On making use of the apparatus for heating the platinum, for either illumination or cautery, the galvanometer-needle deviates in the opposite direction.

On the side of the box there is a rheostat, A, C, which regulates the electrical illuminator or cautery with the accuracy with which a graduated stop-cock would regulate the flame of a burning gas-jet issuing from a pipe. The rheostat consists of a tube, A, containing a hollow coil of fine German-silver wire, in which a graduated metallic rod, C, passes up and down. The more the rod is drawn out, the more of the coil is interposed in the circuit, consequently the greater is the resistance and the less the heating effect. This works so accurately and regularly that the finest and shortest platinum wire can be brought to a state of incandescence, and kept incandescent without melting; and after the point up to which the rod must be pushed in is once determined for a particular effect on a given piece of wire, the same position of the rod invariably produces the same effect.

The end of the rod of the rheostat constitutes one of the poles of the accumulator; the other is a metallic projection at D at the opposite side of the box. To these two poles, C and D, are attached the electrode cords, which go to the handle of the illuminating or cauterizing platinum wire. In Fig. 6 is shown the manner in which the cords are attached to an illuminator which lies at the bottom of the accumulator. At the back of the box are two metallic joints for the purpose of connecting the accumulator temporarily with the primary battery by means of battery cords, seen to project on the right hand side of the figure and marked + and —. There is a handle, E, by which the box may be conveniently carried.

In concluding the lecture various experiments were made. The mouth was thoroughly illuminated and the teeth were translumina-

ted. Not only the accumulator, but also an ordinary galvanic battery, composed of a series of zinc and carbon plates immersed in bichromate of potash battery-point fluid was used as the source of electricity. For performing some of the most brilliant experiments the plates were only dipped in a pail of water in which there was very little of the battery fluid, mostly from the drippings of the plates.

After showing his own mouth and throat, the professor demonstrated the method of illumination in a number of gentlemen who volunteered. To prove that there was no inconvenience from heat evolved with the light, the lecturer placed an illuminator in his mouth and closed the front teeth. He also related the beautiful experiments made by Trouvé, in Paris, and Stein, in Frankfort-on-the-Main, who caused a fish to swallow an illuminator which thoroughly lighted up the interior of the body, in spite of which the fish continued to swim, seemingly undisturbed, in the tank. The translumination of the teeth in several of the gentlemen led to discussion among the dental practitioners present as to the condition of health, disease, and death of some of the teeth shown. In the course of his demonstration, Dr. Elsberg again alluded to the liability of breaking or melting the thin illuminating wire, and showed that in case such an accident happens, it is easy to remove the old wire and replace it by a new one, a number of such little pieces of platinum wire being held in readiness for insertion in the illuminating instruments. In answer to a question, Prof. Elsberg stated that Trouvé's apparatus complete, including a box with handle, cautery, and illuminating instruments, reserve wires, etc., is sold in Paris for 250 francs, or fifty dollars, and he presumed the accumulator could be bought here for about the same price.]

The following communication from Dr. W. C. Barrett was read:

"It was my good fortune to be present at the meeting of the American Dental Society of Europe, at Wiesbaden, Germany, in August last, when Dr. Cohen, of Hamburg, presented an appliance for lighting the oral cavity, which, while not by any means perfect, was a step in advance of anything which *I* had seen. I do not know whether it will be new or if it will present any novel features to my brother Odontologues, nor can I fully and exhaustively describe it; but, judging by appearance, the current from a four-cell Bunsen battery was conducted by insulated wires to a handle, upon the end of which was an exhausted glass cylinder about two inches long and an inch in diameter. The current within the vacuum bulb encountered some partial conductors—lime, oyster-shells, or bits of something of like nature—and these partial conductors, whatever they were, became luminous through the resistance which they offered to

the current. The light exhibited was sufficient for the examination of either the teeth or pharynx.

"Dr. Cohen did not claim to be the originator of the apparatus, and said that it was, as yet, incomplete, but he hoped it would develop into something of great practical utility."

Discussion.

Dr. Dwinelle. I presume we all agree that we have been instructed by the edifying experiments which have been presented to us to-night by Dr. Elsberg. His instrument seems to supply a want we have often felt in our profession, and I have no doubt we shall take advantage of the valuable suggestions he has made to us, and will supply ourselves with instruments of the kind which he has brought before us. They are much cheaper than I supposed, and it seems to me they will open to us all a very wide, practical field of labor. The instrument referred to by Dr. Barrett must be rude as compared with the one exhibited here by Dr. Elsberg. We often want to illuminate the mouth at large, and more frequently to illuminate a single tooth for special purposes. I think it promises to be an extremely useful instrument in our profession. In using this instrument in looking into the mouth of one of the gentlemen here to-night it was determined at once, by the aid of this novel electric light, that one of his teeth was dead. The left incisor was shown to be dull and opaque, while the living teeth were luminous, transparent, and brilliant. I move a vote of thanks of the society to Prof. Elsberg for his lecture and his exceedingly interesting and instructive experiments.

Dr. Atkinson. I most heartily second that motion, and wish to call attention to our indebtedness to the doctor for the manner in which he has presented the subject to-night, and the evidence he has given us of being thoroughly acquainted with what he has presented. Of scientists who call themselves physicists, as contradistinguished from the nobodies they deem others to be who go beyond physics in recognizing metaphysics, we have a notable example in P. H. Van-der-weyde, who, having passed a current of electricity through card-board in different directions, and finding the direction of the current always carried the fiber of paper with the current, came to the conclusion that it must be a ball of some kind of material. You have heard what was said to-night. Are we not advancing? At the time the first publication of Prof. Elsberg's views was made P. H. Van-der-weyde was holding that same view, if he does not hold it to-day. When we come to get at the nexus, and the sum of what has been said about electricity, we will then be better able to assert differently with regard to it. The great point is, we have made a mistake in saying that experiments

proved the electric current to be material. We must have demonstration if we are to be masters of the situation and comprehend function. The exhibit to-night adds very great strength to what I have said so repeatedly, that you had better not depend on the old text-books, because you would have to know all they knew and the discoveries since, to be able to rectify their mistakes so as not to poison the mental pabulum you got from the old text-books. After having heard the paper before us we must give up the use of the terms "quantity" and "intensity," which are an outgrowth or the mental children of a false conception that this "mode of motion" is a material substance. I hope every one will give a good round "aye!" so we may encourage such men to come before us and help uncover the dark recesses of the investigations we are making.

A vote of thanks to Prof. Elsberg was unanimously adopted.

Adjourned.

MISSISSIPPI VALLEY DENTAL ASSOCIATION.

At the thirty-eighth annual meeting of the Mississippi Valley Dental Association, to be held in Cincinnati, March 1, 2, and 3, 1882, the following programme will be presented:

"Definite Causes of Dental Caries." J. S. Cassidy, M.D., D.D.S.

"Microscopic Results of Dental Caries." J. Taft, M.D., D.D.S.

"The Dental Pulp—its Pathology and Treatment." M. H. Chappell, D.D.S.

"The Possibilities of Success in the Treatment of Pulpless Teeth and Alveolar Abscess." A. O. Rawls, D.D.S.

"Filling Teeth with Cohesive Foil." E. G. Betty, D.D.S.

Each subject will be presented by a paper.

N. S. Hoff, *Recording Secretary.*

HINTS AND QUERIES.

"He that questioneth much shall learn much."—Bacon.

Correspondents desiring a reply in this department are requested to make use of *distinctive signatures or initials*, and avoid the practice of signing their communications Reader, Subscriber, etc.

Correspondents who wish notice to be taken of their communications should authenticate them with their names. We cannot insert queries or replies except they are so accompanied. Names not necessarily for publication.

Will some one give me a scientific explanation of the reason why sweets cause pain in decayed teeth?—Isaac Hills.

I have a patient in whom paralysis of the parts supplied by the inferior dental nerve followed the extraction of a lower wisdom-tooth. The patient complains of complete numbness of the skin to the middle line of the lower lip on the side from which the tooth was extracted. Is sensation likely to be restored? Will any treatment hasten recovery? It is now about two months since the tooth was extracted.—W. A. Kested.

A Peculiar Accident Implicating the Hard Palate; Operation.—Carrie L., aged nine years, was brought to my office by Drs. J. G. Justin and J. H. Coe, October 17, 1881, with the following history:—The child, on coming home from school, at mid-day, had received a fall while going up the front steps of the house, having at the time in her right hand a new slate-pencil recently sharpened, and in some way, probably in throwing the hands forward to save herself, the pencil entered her mouth and penetrated the hard palate.

The fall was such that nearly the whole weight of the body was thrown upon the pencil. The point pierced the palate bone about the fourth of an inch to the left of the median line, and about three-fourths of an inch from its posterior border, in nearly a perpendicular direction; the pencil was then broken off, and the blunt, jagged end thrust again into the bone, just posterior to the first puncture, but in an oblique direction backwards, and again broken off nearly level with the surface.

There was but little hemorrhage from the posterior nares, and scarcely any at all from the wound in the mouth, nor did the child complain of any special amount of pain. The friends, of course, were very much alarmed, and were extremely desirous to have the portions of pencil removed. Two attempts had been made by the physicians in charge to remove them with forceps, elevators, and such other instruments as they had at hand, but without success. The slate was so soft and friable that it crushed under the grip of the forceps, and so firmly was it imbedded in the bone that all efforts to dislodge it had proved futile.

The thought occurred to me, on examining the case, that the dental engine was admirably adapted for use in just such cases where foreign substances had been impacted in osseous tissue. I therefore determined to use the engine in this case.

Operation.—With the assistance of Drs. Justin and Coe, the little patient was narcotized with chloroform, and placed in an S. S. White pedal-lever chair, the back being let down to its lowest point, so as to bring the body of the child into as nearly a horizontal position as possible, with the head thrown well back. With a pair of curved scissors the torn edges of the wound were first cut away, then with a new, sharp-pointed fissure-bur, White's No. 73, and the dental engine, the bone was cut away close up to the pencil on three sides of the first puncture, when, with an elevator, it was easily dislodged. The second piece which had penetrated in a more oblique direction backwards and had split longitudinally, was removed in the same manner but with more ease. The hemorrhage was so slight that it caused no inconvenience during the operation.

The first piece removed was pyramidal in shape, a trifle over one-fourth of an inch at the base, and about half an inch in length; the second piece was a little over one-fourth of an inch in diameter and a trifle less than half an inch in length, and split into two fragments.

An examination of the wound after the operation showed the opening through the palate bone to be about five-eighths of an inch in length, and three-eighths of an inch in width. The wound was dressed by syringing with tepid carbolized water. The after-treatment consisted simply in keeping the patient in bed for a few days, and the use of carbolized water snuffed through the nose, as she complained of a bad taste and smell. The wound closed quickly by granulation, and in two weeks after the operation the parents took her with them on a western tour.—John S. Marshall, M.D., *Syracuse, N. Y.*

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ORIGINAL COMMUNICATIONS.

CONSERVATION OF THE TEETH.

[Abstract of the President's Address before the Pennsylvania State Dental Society, July, 1881.]

BY H. GERHART, D.D.S., LEWISBURG, PA.

IN looking over an uninterrupted practice covering a period of more than thirty years, I frequently find myself propounding the question, Has dentistry, with all its researches, improvements, and accessions, proved equal to the accomplishment of the end sought? Is operative dentistry to-day saving for a reasonably long average time the teeth requiring treatment? Or, to put the query more strongly, do even the most skillful operators—those who command the most liberal fees—conserve the natural organs of their wealthy patients for a reasonably long time? Or, combining the two previous questions, are the results of dental practice, aside from the fees, such as to yield professional satisfaction? It would seem that, by implication at least, many answer these interrogatories in the negative.

Let us look at a few facts in the history of dental practice. Thirty years ago soft gold foil and tin were almost exclusively used for filling teeth by the self-styled "respectable" dentists; a few whom their professional brethren stigmatized as disreputable and unscrupulous used amalgam made of coin-silver. In each of these materials, many of the operations of those days still survive. Why, then, has there been the continuous change in materials and modes of operation which the literature of these thirty years reveals on almost every page? What has stimulated the production of the various forms in which gold has been presented to us by the manufacturers? What has called forth the countless plastics, the endless variety of appliances, and the machinery with which our offices to-day are filled?

When we examine the surviving operations of the period spoken of, we find them almost invariably in teeth of firm and compact texture. When we ask, where are the others, the answer is—gone. The men and the women are here, but the teeth and their fillings are not. What is the inference, or rather, what is the fact? It is that the operations of those days failed to preserve the average teeth, and all below them. It is the desire to save these sub-average teeth which has called into being these multitudinous materials and multifarious appliances. The search for ways and means to accomplish this has been earnest, but is still going on. Why? Because the object has not been attained—the teeth most needing help have not been permanently helped; are not preserved for a reasonably long time. It is this fact that has caused the use of cohesive gold, once almost universal, to fall into disuse by many. This it was that led Professor Arthur to adopt his method of separation, the disastrous results of which are rapidly coming to light in the mouths of his patients. This it was that brought about the "New Departure," which was enthusiastically embraced by many, with disappointment as the result. It is, we believe, the unsatisfactory result of their labors, not so much as to remuneration as to the failure to benefit their patients which has impelled many, whether from sensitiveness of conscience or lack of courage and patience, to change their occupation.

If these be truths, the time would seem to have come to change the line of our researches. But who shall indicate the direction of effort and experimentation? There was a time when failure to conserve the natural organs was attributed to unskillfully or carelessly performed operations. The "New Departure" attributes the failure to improperly chosen materials; improperly chosen, because difficult of adaptation, or for some reason incompatible. In many instances, doubtless, one or the other of these causes of failure was correctly assignable, but in a very large—probably the larger—proportion of cases where failure supervenes, it must be attributed to other causes than lack of judgment in the selection of material, or unskillfulness in manipulation. We are, in fact, compelled to the conclusion that the causes of failure are to be found chiefly in the qualities inherent in the organs themselves, or from the lack of qualities which ought to inhere in them. In other words, the texture of the tooth-tissue in the class of cases we are considering, has never attained a sufficient degree of development to enable it to resist the influences of the conditions under which it is placed. The problem, then, is this: these organs are deficient in structure. What are the causes, and what is the remedy? When these questions have been fairly answered, we shall be better able to cope with the

difficulty—not, perhaps, accomplishing much in this generation, nor because of the force of heredity in the next; nor even because of atavism thoroughly in the third generation; yet if people will hear we shall ultimately be successful. Many instances could be cited to show that the teeth of ancient races were almost literally imperishable—as the teeth found in Indian cemeteries hundreds of years after burial; the teeth of William the Red, of England, uncovered eight hundred years after his death, and the teeth of the Druids of Anglesea, which must have lain in the earth at least two, possibly six thousand years. Why may not human teeth be like these again? It is taught by some that deficiency in dental structures is not only the outgrowth but the necessary concomitant of civilization. But there is abundant evidence that the Egyptians of remote ages were a highly civilized people, and possessed of wonderful attainments in the arts and sciences. Professor Darby says that "an examination of the jaws of a large number of mummies revealed the fact that not only were the teeth without decay, but they had also ample room in the jaw." The people of Europe are civilized, but gentlemen who have practiced there have told me that their practice, in some portions at least, was more satisfactory, because of the greater probability of the permanence of their operations, on account of the firmer texture of the teeth. It is a notable fact that the teeth of Americans are more universally and more extensively the subjects of caries than those of any other people.

Now, if we can ascertain what are the underlying causes of this decadence, the elements in our phase of civilization which render our teeth more liable to decay than those of other people of a different civilization or of no civilization, we shall have gained a grand vantage-ground.

In the search after these underlying influences, climate is sometimes mentioned as a potent agent; but the fact that the aborigines and the field hands of slavery were almost exempt from caries, must relegate this theory to a place among the fallacies. Some attribute the deficiency in the structure of our teeth to a failure to introduce into the system the necessary elements, and point to the fact that a large portion of the phosphates is removed from our grain in the milling. There is, doubtless, some force in the argument; and yet it would seem that, except where the diet is exclusively white bread, a sufficient variety of elements, and in sufficient quantity, is introduced into the system to build up under the influence of the selective affinities all the tissues, if there were no functional derangement.

My own conviction is that most of the derangements which dentists are called upon to treat are largely due to the non-performance

by the teeth of one of their chief functions; in other words, to the non-performance of the normal amount of mastication. The internal structural form of the teeth, the character of their attachment and of their occlusion, clearly indicate the nature of the work they are intended for. The development and power of the muscles concerned in mastication depend upon the proper performance of this function, and the same may be said of the maxillæ. Are not irregularities and crowding of the teeth to be accounted for on the same principle? Is there any reason why the general law that development depends upon exercise of function should not apply to the teeth? Those who have followed the microscopic investigations of Heitzmann and Bödecker can understand that there is in the teeth the same sort of irrigation of their tissues furnished by the capillaries of the pulp as there is in other tissues through the attenuated walls of their own capillaries; that there is exercised the same selective affinity, and the same rejection of unsuited elements, and, as a consequence, there must be the same liability to retrogressive changes that there is in other tissues.

TREATMENT AND FILLING OF APPROXIMAL CAVITIES.

BY E. S. TALBOT, M.D., D.D.S., CHICAGO, ILL.

(Read before the Ohio State Dental Society, December 8, 1881.)

The treatment of approximal decay in bicuspids and molars is one of the perplexing and difficult problems of dentistry. Able writers on the subject have advocated every degree of space between teeth, from the temporary separation and contouring of approximal surfaces to the cutting away of one-third of the tooth. To the late Dr. Arthur we are indebted for many ideas on the subject, some of which will always be invaluable aids, while others have already become obsolete. Dr. M. H. Webb, the expounder of the contour mode, is able with the electro-magnetic mallet to produce contour fillings which are inimitable. Both operations have advantages, but it is questionable whether an ideal protection has yet been reached in the matter of filling approximal cavities. If in youthful patients, particularly those who are poorly nourished, consumptive, or scrofulous, we find the arches well filled with teeth and decay rapid, I believe it better to sacrifice a tooth on both sides and prevent disintegration from too close proximity than to retain the full number of teeth and either cut away until the original contour of the tooth is lost, or leave the patient's teeth constantly liable to decay.

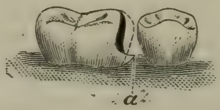
Having had access to one of the largest dissecting-rooms in the country, I have studied the arrangement of the teeth there seen, as

well as those of my patients, to ascertain the best natural method of resisting decay. I find in comparing the different grades of humanity that the teeth of the lowest in the scale—those furthest removed from the influences of civilization—are most suggestive of points worthy of consideration by the dentist. These teeth are quite dense in structure, and from the palatal to the buccal surfaces they present a pear-shape; the widest part of the teeth from the mesial to the distal sides being near the grinding surface, making the point of contact at the anterior and posterior bucco-approximal angle, the greatest spaces being at the palatal and cervical extremities. This seems to be nature's method of preventing the food from crowding between the teeth during mastication; while the spaces at the gums and palatal surfaces allow for easy cleansing by the action of the tongue, indicating neither a full contour nor too much cutting away, but a medium between the two extremes. If upon examination we find extended decay in the approximal surfaces, the frail walls should be cut away with a chisel until solid tooth-structure is reached, taking care to retain the shape of the tooth, after which the surfaces of the tooth should be polished with emery strips. If, however, there is but little decay and only simple cavities, the teeth should be separated until sufficient space for operating is obtained; then with emery strips the surfaces should be polished, enabling the operator to distinguish the line of demarkation between the healthy and the disintegrated tooth-structure. Should the sulcus in the crown become involved, accompanied by extensive decay upon the approximal surface, it is expedient to make a compound cavity of the crown and posterior approximal cavities by cutting through the dividing wall, preparing a retaining-pit at the mesial extremity. We are frequently enabled by this mode of operating to make a simple cavity in the approximal surface of the adjoining tooth and save considerable tooth-structure. A groove should be cut in the dentine along the wall from the grinding surface across the floor of the cavity, extending to the grinding surface upon the opposite side, for the purpose of starting and retaining the gold. The groove is more desirable than the retaining-pit for several reasons, viz.: it overcomes the liability of drilling out of the tooth or into the pulp-chamber; in starting a gold filling in difficult cavities there is less danger of the gold rocking, and a greater certainty of the margins of the cavity being well filled.

The literature of this subject for several years past indicates the chief causes of decay and failure to be: Want of cleanliness; tooth-structure coming in contact with tooth-structure; the margins of two approximal cavities coming together; breaking of frail walls of cavities; sharp corners which become roughened by pluggers in

operating; the improper shaping of approximal cavities; chipping off of the enamel at the necks of the teeth; the use of cohesive gold, particularly at the margins of cavities, and the improper finishing of the gold at the cervical margins. Practitioners are familiar with these causes, and have various ways of obviating them. Since the introduction of the dental engine, its bur has proved of great assistance in rounding and smoothing the margins; but even this fails us when the cavity extends to and under the gum. When the decay in an approximal cavity reaches nearly or quite to the neck of the tooth, there is a projection of tooth-structure at that

FIG. 1.

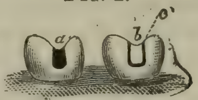


a—Point to be cut away. The dotted line shows restoration with gold.

point (Fig. 1, *a*), composed of the remnant of enamel and dentine, the enamel tapering to a very thin edge, which is in danger of being chipped off while packing the gold. This place is liable to become the point of contact with the adjoining tooth, and the food crowded into this space between the point of contact and the gum causes decay. In shaping the tooth this substance should be cut away, making a straight line from the root to the point of contact, after which the cavity should be prepared and the rubber dam applied.

By removing the moisture and applying an antiseptic we are enabled to examine the cavity and be satisfied that only the dark-colored dentine protecting the pulp remains. By rounding the mar-

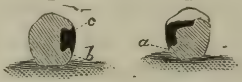
FIG. 2.



a—Cavity before preparation. *b*—Cavity after preparation. *c*—Rounded margin.

gins of the cavity (Fig. 2, *c*; Fig. 3, *a*, *b*, *c*) with proper instruments, the surface of the tooth having been previously polished with fine emery strips, we are able to carry the gold over the edge of the

FIG. 3.



1—Section of the tooth midway between gum and grinding surface. 2—Longitudinal section from grinding surface to gum. *a*, *b*, *c*—Rounded margins.

cavity; the gold must be packed closely to the enamel, and extend to the natural contour of the tooth. The filling should be trimmed and polished with emery strips until it assumes a well-defined out-

line. In starting the filling cohesive gold should be employed, allowing it to project into the cavity, which should be lined with soft or non-cohesive foil extending over the margin of the cavity; the contour to be restored with cohesive gold. If the cavity be a simple one upon the approximal surface, soft or non-cohesive gold alone should be used. I devised some eighteen months ago a set of instruments for facilitating these operations, which can be readily carried below the margin of the gums, and the sharp edge of the cavities removed without injury to the soft parts, or cutting the rubber dam after it has been applied. They are made rights and lefts and at different angles so as to reach the border of almost any cavity. They are tempered quite hard, and require little pressure to shave off the enamel. One of the plugger points is similar to Dr. Abbott's, and the others are modifications of this one. The shapes of the instruments may be changed to suit the convenience of the operator, or to reach any difficult cavity, without changing the cutting edge. In my opinion, if the rules mentioned in this paper are observed, most of the difficulties enumerated may be overcome.

MOUNTING PORCELAIN CROWNS.

BY W. H. GATES, D.D.S., PHILADELPHIA.

The history of the tedious and uncertain operations for the partial or entire restoration of crowns in contour and their subsequent fate is instructive but painful; while the number of valuable roots sacrificed from fear of such restorative operations—their name is legion.

Regret is vain, but reform is in order. With an unexceptionable crown at hand, and simple, practical means for mounting it, a new era has opened. The porcelain crown with proper complement is the consummation so devoutly wished for. Having as means of attachment a perfect junction by amalgam supported by a double-pointed screw, the root is thoroughly protected, while the crown conceals the amalgam; and even the fine line of the periphery of the junction, since nature always provides a free edge to the gum, is not suffered to mar the beauty of the setting.

There is great gain in having the remains of the natural crown entirely removed, as they obstruct light and often the direct approach, both important factors in the successful treatment of the canals. In fact, when we consider the great facility with which a new crown can be mounted, we ought not to jeopardize the permanence of any root for the sake of retaining its imperfect crown. For instance, if the anterior wall of a lower molar is not present, the curved mouths of the canals adjacent may be readily put in line

with the deeper parts of these canals by free enlargement towards their anterior borders; but if that wall be present, there is too much risk of penetrating the floor in the effort to cleanse and fill the canals.

Experience teaches that roots filled carefully to the apex remain sweet and permanent without discoloration; but when simply smeared with creasote with but partial filling, as is so often done, the foundation is laid for future trouble.

After cutting the natural crown away, gutta-percha may be employed for support temporarily, or to reduce, if congested, the free edge of the gum. A root, for instance, quite hidden under a morbid gum may be uncovered in a few days by inserting a double-pointed screw lightly into its canal and pressing thereon a suitable portion of gutta-percha; but before inserting the screw a small vent should be made with a fissure-bur along the side of the canal, to remain until the root has been properly treated. Inexpensive gutta-percha will answer this purpose. The instrument and fingers should be moistened when using it to prevent its adhesion. If a pendent lobe of the morbid gum, however, occupies most of the cavity over the root, it is better to excise it at once with sharp scissors.

As with corundum disks, stump-wheels, and round points the natural crown can be cut away as desired, it is often convenient to leave the labial surface of front teeth standing until assured of a satisfactory result of the treatment of the pulp-canal,—gutta-percha supplying a temporary contour. But when preparing to mount the porcelain crown, the natural one should be cut away to the cementum, especially at the front surface—leaving the joint to occur at the base of the free edge of the gum. For this undercutting the dental engine is almost indispensable. Round burs moving *from* the gum cut safely and effectively, but Northrop's corundum points No. 6 cut more smoothly and *in line with the gum.* To finish, shape the end of the root concave; sink lateral shallow pits or stay-grooves therein; ream out the canal to nearly once and a half the thickness of the screw, and make retaining-pits in its stronger walls with a safety-bur, *e*, Fig. 4.

Though the porcelain crown is designed to reach the base of the free edge of the gum for greater strength and for the practical concealment of the junction, yet if the gum has receded from its normal position at the lingual aspect, only so much of the root should be removed at that part as will admit the crown to the position desired.

To fit the crown with accuracy and facility, a cast, though of the simplest character, is required. The impression may be taken in

the base of the crown itself filled with softened gutta-percha, care being taken to carry it against the root in the line of the position it is to occupy permanently. To form the cast, let the plaster extend from the impression so as to include an approximal surface of the crown, thereby securing a guide to the correct position.

If desirous of setting the crown at once, warm up the cast, remove the impression, indicate the root with a soft pencil and isolate it on the cast, excepting its connection with the guide-surface, and the crown can be speedily fitted, the presence of the patient being required only to determine its proper length. If an additional sitting be preferred, the crown may be set temporarily or the gum supported by gutta-percha as before mentioned. In either case when inserting gutta-percha into the enlarged canal, care should be taken not to compress air therein. To avoid this, let the stick of gutta-percha investing one-third of and extending somewhat in advance of the screw be smaller than the canal, so that upon insertion it shall first occupy the deeper portion, and then as the screw is forced up, the air will be displaced. In fitting the crown to the cast use a heavy wheel to shorten if necessary any part of the basal outline, cutting any way but outwards, thus avoiding the liability of chipping the enamel. Cut the crown a trifle shorter than is required for proper articulation to allow for the amalgam joint, as when once set no grinding can be done except on its antagonist.

When the right length is assured, restore as much concavity to the changed base as regard for its strength will permit. Do not make the edges so thin as to endanger chipping, and let the extreme edge be beveled at an obtuse angle, so that strength as well as the thinnest possible line of amalgam at the junction may be secured.

In mounting the crown a double-pointed screw has certain important advantages. It forces the mercury out of the necessarily soft amalgam in the root as only a conical screw can, and leaves the amalgam in perfect condition. It presents a broader surface for resistance in the direction of the greatest strain, and it can be inserted with ease and facility in any position in the mouth.

Fig. 1 represents the screw as held by the carrier for insertion in all roots approachable in direct line.

Fig. 2 represents the screw with the parts of the carrier detached, showing their design and application. The perforated screw receiver, made of steel, has a spring, *b*, acting outwards, and a pin, b', to act in the slot, a', of the screw. When the screw with the end, a'', inward is placed therein, and the spring compressed, it passes into the sleeve, *c*, which, acting on the bearing, b''', and the jaws, b'', prevents it from opening and also from turning. The front portion of the handle, *d*, is inserted into the sleeve, *c*, from the opposite direction,

its pin, d''', entering the slot, c'', while its extreme front, d'', passes into the screw receiver and acts against the end, a'', of the screw, which fits therein. Thus the screw firmly held is carried with direct force into the amalgam, and upon a slight withdrawal of the sleeve, c, by the shoulder, c''', the spring opens, and the screw is detached from the carrier.

Fig. 1.

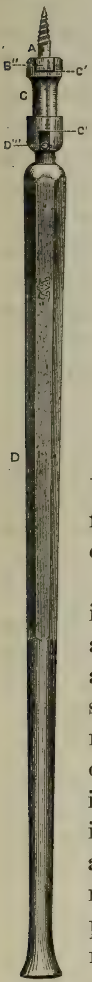


Fig. 2.

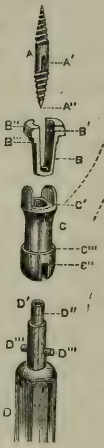


Fig. 3.

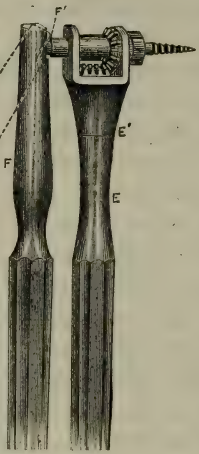


Fig. 3 shows the carrier modified to insert the screw at different angles. The hand shaft, e, acting through a collar from e' to its bevel gearing, revolves the screw, which is freely held in any desired position by the handle, f, moving on a limited ball-and-socket joint at f'. When the screw is inserted into the amalgam, its release from the carrier is effected by slightly moving the front end of the hand-shaft, e, towards the joint, f'.

When ready to mount the crown, select and place the screw in the carrier, and dry the prepared canal before mixing the amalgam. Mix the first portion quite plastic, fill the canal about two-thirds full, and insert the screw in rapid succession. See now by closing the mouth that the screw does not antagonize an opposite tooth, and by trying on the crown that it is central in its proper place therein. If not, immediately tamp, and, if necessary, drive it with the tamping-arc, d, Fig. 4, to the correct position, and prepare next a second portion of amalgam as dry as you can possibly make it cohere by rolling it with the index finger in the palm of the hand. Cut the roll into thin slices, and, after removing with a flat burnisher the soft surface of the first portion, tamp the second in and around the screw with a tamping ring, b, Fig. 4, which secures the screw immediately in the place adjusted. This ring and the arc, if grooved in the working face and inlaid with gold, will cut out appropriate portions of the prepared slices, and either or both may be employed to carry to, and finish hard this dry amalgam in the outer end of the enlarged canal around the screw. Mix now a third portion of amalgam very tiff, place it in a tamping-cup (c, Fig. 4), pass it over the projecting

end of the screw, and mallet it quite firmly around the base of the same. This cone represents the greater part of the amalgam that must intervene between the root and the porcelain crown, which is thus relieved of the principal strain in being set, and the stability of the operation is also assured. As the base of this cone extends to and anchors in the shallow stay-grooves previously mentioned, it may be trimmed down somewhat, if, by reason of shortening the crown in fitting, it should prevent the latter from freely taking its proper place. At this stage of the operation permit the amalgam to set for a half-hour, and, if the crown be an incisor or cuspid, fill the retaining-grooves, that the amalgam may be setting in them also. Mix the last portion thin, place a suitable amount as a lining in the base of the crown, try therein a cast made from the tamping-cup, and then apply with firm pressure to its place on the root. If there proves to be too much amalgam, remove the crown immediately, and with a sharp blade trim off from the middle to the apex of the cone such portion of its surface as may seem necessary. Replace, tap the crown into position with lead or wooden mallet, and repeat if necessary. A little practice brings facility. Finish the palatal cavity with dry amalgam, trim away any excess at the joint with a small flat burnisher, and caution the patient not to use the tooth at all for a few hours.

FIG. 4.

In applying the porcelain crown to molars and bicuspids, it will rarely be necessary, with this careful manipulation of the amalgam, to insert more than one screw in each—that of course in the principal canal. The screw, made of platinized silver and being soon supported by its surface union with the amalgam, is so strong, and its position so central that amalgam alone properly extended to, and anchored in, the remaining canals, will add what support is needed. The instruments shown in Fig. 4, modified in construction, operate at all required angles. Rubber dams are quite unnecessary, and it is of no consequence that the cone of amalgam should be kept dry while setting, as rinsing and drying it off with spunk restores a good surface upon which to build.

CRITICISM OF A CLINICAL LECTURE.

BY E. PARMLY BROWN, D.D.S., FLUSHING, N. Y.

In the DENTAL COSMOS for January, 1882, appeared a report of a clinical lecture delivered at the Philadelphia Dental College by Dr. M. H. Cryer.

I consider that there are several serious errors in the teachings of

this clinic, which it seems proper, for the sake of the younger members of the profession, should not pass without criticism. The lecturer claimed that the making of an artificial denture with a band and single teeth soldered to a gold plate by means of stays requires more skill than does the filling of cavities with gold, and that to learn the so-called mechanical dentistry takes ten times as long as it does to learn to fill teeth with gold. This statement seems to me diametrically opposite to my observation and experience. More than forty years ago, Solyman Brown, father of the writer, published a series of papers, illustrated with woodcuts, on gold plate-work, and that kind of work was then made by him as artistically as it is made to-day; but it has required these forty years, with all the ingenuity and application of the best men in the profession, to bring the art of filling with gold to its present state of perfection. I have been watching the progress of dentistry in the United States, and especially in New York, for thirty years, and I can remember a hundred capable mechanical dentists where I can count ten who were as capable relatively of making good gold fillings. At the age of sixteen, after one or two years of instruction, I could produce finely finished partial gold plates, but it has required twenty years' study and labor to accomplish as good work comparatively in filling. I will venture the assertion, that of ten students taken at random from any dental college in the land, eight can be made expert workmen in the laboratory, where but one of them could be made to do as well in the operative department. The making of gold plates is to a large extent imitative, while filling requires invention, almost every case being a new problem. In the one case the work is upon inanimate metal; in the other it is upon the sensitive tissue of an animate being.

The lecturer defined operative dentistry as the bringing of teeth from a pathological to a physiological condition for the ultimate reception of mechanical treatment. As the terms are generally understood, it is the office of dental surgery to bring the teeth into a proper condition for the performance of operative dentistry; and then, third and always last, if at all, comes mechanical dentistry.

I consider it very risky to seal up with cotton and sandarac varnish any cavity from which a dead pulp had not been entirely removed. I have seen many cases in which the patients suffered agony from this cause. Indeed, the lecturer himself directs, that if the patient feels the presence of the tooth, the cotton should be removed. Why not leave it unsealed and run no risk?

I consider the filling of the roots of pulpless teeth with cotton as bad practice. A root filling impervious to impure matter is just as easily used. I prefer gutta-percha in most cases. This criticism

holds good if the lecturer intended that the cotton should be left in the teeth mentioned, and I infer that he did, as he stated that one was ready for the gold filling had time permitted. I have removed too many cotton-fillings to relieve trouble produced by them, to make me willing ever to put one in a tooth when a perfect root filling is at hand.

Why was the pulp destroyed in the right upper cuspid, when the lecturer admitted that the inflammation had been reduced, and that the tooth was quite comfortable after the application of carbolic acid and morphia? It seems to me wrong to teach the destruction of pulps unless they are hopelessly diseased. But if the lecturer uses such a powerful astringent as the oxychloride of zinc to cap pulps with, I do not wonder that he shrinks from attempts at saving them. The left superior central incisor was found in the same condition, and the pulp was likewise sacrificed. I used oxychloride over pulps for more than twenty years, but without success unless an ivory cap intervened in cases of exposure, or a layer of gutta-percha in those of near exposure. But oxyphosphate serves as a non-irritant covering, enabling us to dispense with other capping materials, and is easily applied of the consistence of putty.

I condemn the practice of always making a shallow groove back of the edge of the cavity at the cervical wall to retain the filling-material, as recommended by the lecturer. This leads to the undermining of many approximal fillings, as a line of tooth-structure is thus cut off from its life-sustaining connection. Apart from this it is a delicate edge, liable to be bruised during the operation of filling. Moreover, it does not retain the filling when completed any better than two pits, properly drilled, would; nor as well even, unless the groove be made very deep, which would thereby increase the dangers specified.

The advice never to hold a filling in by retaining-points I consider bad teaching. To dispense with retaining-points involves a liability to an undermining of the margins, which can be avoided if cohesive gold be properly solidified by steel mallet or electric plugger.

The retaining-pit has the advantage over the undercutting system in four respects: the saving of time to the operator; less pain to the patient; the removal of less dentine, and less liability to a blue line around the filling. In building up gold crowns on live teeth, worn down evenly, I always use retaining-pits in preference to grooves, believing that greater strength can be thus gained, and without the removal of so much tooth-structure, and without the risk of a dark line next to the gold.

Finally, the lecturer says "the first few cylinders should not be annealed." I prefer to anneal the first gold placed in the starting-

pit most carefully, desiring especially that no movement of the gold should take place from the very beginning.

COMMENTS ON "TRUTH VS. FICTION."

I do not propose making any more definite my position and statements regarding Prof. Arthur's claims to priority in successfully promulgating the doctrine of leaving, under certain circumstances, "decayed, dead, and decomposed" dentine in cavities of decay, and filling thereupon, but I desire to add the fact, that Prof. Arthur's views regarding Dr. Dwinelle's position in this matter were precisely those I have advocated. In proof of this *I have Prof. Arthur's written opinion*, and I believe that had Dr. D. assumed his position of April, 1881, during Prof. Arthur's lifetime, and had he, in support of this, read his third article and called it his second, *I* should have had no occasion to enter the lists, but, knowing what I knew, I felt it to be justice to one who could not speak for himself that I should state what I did.

As for the "entire disposal" of any position of mine by Prof. Buckingham, or any "conclusive" showing of error in my statements, I will say that in regard to this I have a very decided difference of opinion from that expressed by the writer of "Truth vs. Fiction;" while for his statement that I have a "characteristic system of perversion and withholding the whole truth by giving a part and leaving out that which makes the context, in order to gain a point," I have only the comment that my record is before my profession, where I leave it with feelings of conscious security.

J. Foster Flagg, D.D.S.

[We regret that Dr. Flagg's article "Credit to Whom Credit is Due," published in our October (1881) number, should have been the occasion of so much controversy, and hope that the above will conclude a matter which has involved more personalities than we willingly admit to our pages.—Editor Dental Cosmos.]

PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

Regular meeting at the house of Dr. Howe, November, 1881.

President Bronson in the chair.

Dr. Benj. Lord. I had the pleasure of attending the annual meeting of the American Academy of Dental Science the last of October. I found it very pleasant, socially as well as professionally. I think there was great interest in both respects. The academy desired me

to convey its greetings to this society, and to express the regret that they did not see our members more frequently at their meetings. At the time of the meeting I may say that Dr. Joshua Tucker was lying very ill. He has since passed away. About three weeks before that time Dr. Daniel Harwood died. Both of these gentlemen had been in practice about fifty years, and of course they were very intimately connected with the early history of dentistry in this country, and very honorably and usefully connected with it, as every one is aware. It is perhaps quite a coincidence that their deaths should be so near, as they were in partnership so many years in Boston. At the meeting, Dr. Tucker's usefulness and character was alluded to with great feeling. He was very much esteemed in Boston. He had made himself very useful to young men in the profession in various ways, and the dentists of Boston were very much attached to him. I had known something of this before, but it was made very apparent at the meeting. It will be remembered by many that he was at our special meeting four years ago. He was at my house, and we enjoyed him, socially, very much. I inquired at once when I reached Boston about him, hoping to see him, but he was prostrated with paralysis; he died on Monday of last week. He was in his eighty-first year, but he never for a moment lost his interest in dentistry. It will be remembered by those who were in Boston a year ago last summer, and by those who have read the report of that meeting, that he made some extended remarks. He also delivered the annual address before the academy a year ago; he was then in his eightieth year. I think he had not practiced recently, but he never lost his love for the art—it was still warm and fresh. Dr. Harwood was also in his eighty-first year. He had not practiced I think for some years past.

Dr. John B. Rich. As those men are passing away, I think it but just to pay a tribute to their memory. Dr. Harwood was the very best tooth-filler in the country, and that was saying in the world. In the early part of my practice the work of Dr. Harwood was remarkable above that of all other men for the perfect manner in which it was performed, and for a long time he was the great standard rule of very extraordinary work. When I entered the profession his name was a great one—even Hudson's name paled before it, because Dr. Harwood was a much more highly educated mechanic than Dr. Hudson. Dr. Hudson was an Irish gentleman, one of the refugees of '98, and took up dentistry to get a living. Dr. Harwood was a thoroughly educated mechanic; I spent many delightful hours in his company talking over the principles of the practice of our profession, and the application of mechanics to it. He was thoroughly acquainted with the principles of natural philos-

ophy, and brought all his knowledge to bear upon his profession with an honesty of purpose in the execution of it that is not often seen. It has been my unfortunate experience to know but few men, no matter how promising they were, who stood steadfast after having achieved success. Dr. Harwood was one of the men who did. In the most busy part of his practice he was the same faithful, conscientious workman and mechanic. I could talk all night about young men who start enthusiastically in our profession, but who become careless the moment they become successful.

Dr. Lord. I think it will be of interest to this meeting for me to report that the academy took action upon the membership of the Drs. Sheffield, of New London, for their manner of advertising. It was regarded as unprofessional and unwarrantable. They had been warned the year before, but the warning was not heeded, and they were both expelled. It will be remembered that this matter, the advertising of the dentists, was discussed at our last meeting.

Incidents of Practice.

Dr. S. G. Perry. For some little time past I have had much satisfaction in setting the Bonwill crowns; I have, however, set a number of them a little differently from the methods advocated by Dr. Bonwill. I have drilled near to the apex of the root, and have firmly set a screw, filling around it to the margin of the gum with amalgam. I have then set the crown on the projecting end of the screw, using either amalgam or the oxyphosphate. In several badly decayed roots I have thought that I secured a firmer attachment than by the barbed pointed wire that Dr. Bonwill describes. Those who have set screws in the dentine must have discovered that they must be very accurately made, and very carefully set to hold well. Several years ago, to insure greater accuracy, my assistant, Dr. Woolfolk, made and attached to the adjusting screw of the die-plate a little micrometer, by means of which the screws could all be cut with mathematical accuracy. I use four sizes of screws made in this way. Being accurately made, I find that the screws can be more securely fixed in the dentine than those we have been in the habit of using.

Dr. Rich. The great difficulty and great error with these as well as with all others that I have seen, is that the threads are too fine. The coarsest thread you can possibly work would hold best in dentine. As a general rule all the screws I have ever seen have been very much too fine. There has been a great need of accurate knowledge of screws as applied to our uses. I hope very soon to be able to show that screws properly made can be of very great service to our profession.

Dr. Perry. I think you are quite right, but I have not been able to get such screws. I searched all over New York, and last summer spent much time in London looking for them, but without success. The coarsest I could find are these which I exhibit. If you have any means of cutting a coarse screw, I should be very glad to avail myself of it.

Dr. Rich. You can make the die very easily; any dentist can make it. There is not a dentist I know of who is not ingenious enough to do it.

Dr. W. H. Allen. In confirmation of Dr. Rich, I have a screw-plate which cuts one thread where there are three in these.

Dr. Wm. Jarvie, Jr. I am very glad if we can get such screws, for I have also hunted all over New York for taps and dies to make them, and I never have been successful. I have thought that one great drawback to the use of screws arose from the fineness of the threads of those we have had to use.

Dr. F. Y. Clark. I should like to ask Dr. Perry if he sets the screw in the root and the crown on the screw the same day?

Dr. Perry. Sometimes, but not always. Instead of attaching the pivot to the crown and then fixing it by one way or another in the root, I think it a very great advantage to fix the pivot by any means you choose firmly in the root, and then to slip the crown on the projecting portion, using amalgam or the oxyphosphate to secure it. This gives strength in the root, where it is most needed. It seems strange that the profession have not been quicker to see the advantage of this simple means of pivoting. I think Dr. Bonwill deserves much credit for what he has done in this direction.

Dr. Rich. While we are on the subject of screws, I will state a little device of my own for preventing screws from turning when fixed in the root of the tooth. I file away a small portion of the screw that goes into the root making what is usually known as a key-slot; by filling this with amalgam and allowing it to harden, you have the screw so fixed that it is impossible for it to turn until the amalgam is taken out. It is a very easy and a very sure method of preventing the screw from turning around.

Dr. J. Morgan Howe. I saw a tooth to-day in a lady's mouth that I set on the right second bicuspid five years ago, in exactly the manner Dr. Perry has described, except that the tooth was an Ash's tooth and was countersunk and had a gold nut fitted in the countersunk hole. The nut had by some means or other been forced from the screw, and the tooth was consequently loose. I have had the same accident happen before with the same kind of tooth, and I have since repeatedly repaired the damage by filling the countersunk hole with amalgam in a soft condition, making a nut of it. It has held satisfactorily.

Dr. C. P. Crandall. For several years I have been in the habit of using screws, tapping the holes in the dentine with the gold screws themselves. They can be very firmly set in this way, as the screws adapt themselves very closely to the dentine.

Dr. Perry. The wire I have been using is made of platinum and iridium. In the setting of crowns you must see how philosophical this method is compared with the old one of soldering the pivot to the crown and fastening it to the root by means of gutta-percha or oxychloride.

Dr. Rich. It is exactly the opposite of the so-called Richmond method, and is certainly on more correct mechanical principles.

Dr. Perry. Yes, sir, and it has the advantage of leaving the gum undisturbed.

Dr. Clark. Some time ago a gentleman of this city called on me to have the remains of a first right inferior molar removed, the crown of which had been broken off below the gums some days before in attempting to extract. On close examination I found the fracture almost even with the alveolus, and the roots more than usually thin or flat, offering a poor or uncertain anchorage for barbs or screws. I therefore made a gold cap so as to fit the broken surface, and attached a piece of spring wire about the sixteenth of an inch in length on the buccal and lingual sides of this crown or cap, so that when sprung over the broken surface, these little projections would catch between the roots something like our cow-horn forceps. When the tooth was added to this cap, and the whole finished and put in place, it looked strong and secure, and I am quite sure it cannot be displaced in mastication. I have never heard of a crown being secured in this way, and therefore report it.

Dr. Rich. I want to say something on a subject that may possibly be of interest to some. For several years past I have been experimenting with paper for drying cavities, having some facilities for getting it from Japan, as one of my patients is one of the United States Consuls there, and has sent me different kinds of Japanese paper. After many experiments with paper to find which was the most ready to absorb moisture, I found one kind from Japan was the very best. It would pass the water from one vessel to another more readily than any other I had found. I have brought some here to-night so that the gentlemen of the society can try it. This paper, which is made of the under-bark of a certain tree that grows in Japan, is put together and made into paper by rice-paste, which is disagreeable stuff, but it can be worked out by rubbing the paper thoroughly. It is of a long fiber and will tear very straight, and is very tough. The subject of paper has been an interesting one to me, for I was the first one to introduce it to the profession, although it

has been claimed by others for the last twenty-five years. It was introduced by myself at one of the meetings of the American Society of Dental Surgeons some thirty-three years ago. I sent a circular to every prominent dentist in the United States, asking what substances they used for drying cavities, naming a number of articles I was experimenting with. The circulars came back without anybody having marked paper. I then knew that up to that time I was the only one who had used it.

Prof. Jas. Taylor then read the following paper on "Cylinder Fillings:"

My articles on block or cylinder fillings published in the October number of the *Dental Register* of 1850, and the January number of 1851, were in part compiled from my lectures to the dental students of the Ohio College of Dental Surgery. The Mississippi Association of Dental Surgeons had requested an address on the subject the year before, and at their meeting, September 10, 1850, this address was delivered. In preparing now an article on this subject I shall somewhat revise what I then wrote, bringing it up to the present improved status of the profession. Wherever I embody from the original article to any extent, I shall mark the same as quotation. In treating this subject before a dental class I necessarily often make application of pathological and physiological principles to govern practice, and I fear that this custom will even find its way into this article, but if it leads to discussion and the elucidation of truth I shall be content.

In opening the subject I said that "I would reiterate the remark made at our last meeting when this subject was under discussion, which was, considering the importance of the operation, its frequency and the difficulties attending it, it is strange that so little of that which is specific in the detail has been given by those who have written on the subject." [This was truer then (1850) than at present.] "It is not so in relation to any of the operations of general surgery, and yet there is no other performed one-twentieth as often, save the extraction of teeth.

"It is very easy to say that the decay must be thoroughly removed, that the cavity must be well shaped, and the gold well consolidated.

"This is all true and appears so simple and plain that every man thinks he can do it easily, and indeed nothing is more common than for young and inexperienced operators to think they can fill a tooth as well as any one."

In discussing this subject, I may not be able to go into all the details, but will give general principles, and for convenience of description will give classification of cavities, and for brevity I shall make

these classifications as few as possible. Nor can you describe without a name, and the name should locate the cavity; hence I have adopted the following general classification:

First, central.—These are those on the cutting or grinding surface of the teeth. The molars and bicuspids most generally give us these.

Second, the labial.—Here I include those called buccal. The description for one answers generally for the other.

Third, the approximal.—These are situated as the term implies on the approximal surfaces of the teeth, and form as a class the most difficult to treat. They are found on all the teeth, and in form are modified by the shape of the tooth affected.

Fourth, the palatal.—The name denotes their locality. They are the most rare.

These four embrace about all, yet we have combinations of them. Such as the central and approximal, the central and labial, the central and palatal, the approximal and palatal, etc., etc.

Let us first consider the four distinct and marked divisions, and then some of the combinations.

We come then to, first, the central cavities. "The first duty of the dentist is to carefully examine the nature, depth, and extent of the cavity he is about to fill. If the decay is deep, he wishes to know if the nerve is encroached upon, the condition of the dentinal structure, and the strength of the walls of the cavity. To determine these several conditions he must carefully probe the decay, scrutinize the color of the enamel and tooth. When this has been satisfactorily done, the next step is to uncover, as it were, the disease; that is, break down the frail portions of the enamel which generally hide from our view the extent of decay in the dentine.

"The first step in the preparation of the cavity is therefore to remove this enamel, and for this purpose I have some half dozen cutting instruments of different forms, flat on one side and beveled on the other, so as to form a cutting-edge like a chisel. In the use of these I commence at the center of the decay, and break in piece after piece of the enamel until I find the border firm and strong; then with an excavator remove all the softened portion of the tooth, and by the time this is done every point around the opening is so exposed as to indicate the exact line to which we should carry the use of the cutting instruments. I use these instruments because they are more speedy and produce less pain than the drill. After, however, I have progressed thus far in the operation, if the cavity is round or will bear being thus formed, I select a drill as near the size of the decay as possible, and with this round the mouth of the cavity, but it must be recollected that all the cavities are not of this shape, nor will admit of this construction."

Since the introduction of the admirable engines which we now have, the drill has become a far more efficient instrument than formerly, and can be used in forming and preparing a large proportion of our cavities. Still, in deep-seated caries and very sensitive dentine I prefer a good sharp excavator, so bent and pointed that I can reach every part of the cavity.

In the use of these instruments, it is well to remember that the cutting should be from the nerve, and this is specially the case in deep-seated caries.

Every practitioner of experience and observation must have observed the cessation of sensibility to some extent which follows the perfect removal of the carious portion from a sensitive tooth. How shall we account for this? Is it the diseased portion already softened by disease, the touching of which gives such pain? If not, why is the sensibility so obtunded when this is removed? "To avoid as much pain as possible in the removal of such decay, as well as to facilitate the operation, I select some point of the cavity most accessible, and then with an excavator well adapted to the cavity reach as soon as practicable the firm structure beneath; then with each stroke or cut of the instrument lift, as it were, the carious portion from the healthy dentine. When practicable and there is no danger of exposing the pulp, I aim by one or two quick revolutions of my instrument to cut and raise from the normal dentine all the softened and inflamed structure. In deep decay this can be done by circling around the walls of the cavity, leaving the portion over the pulp the last to be removed.

This is specially necessary when we anticipate its exposure. When, however, there is much sensibility around the border of the cavity in the dentine just beneath the enamel, we need not expect exposure of the nerve; in deep decay, when there is no sensibility at this point, a dead or exposed nerve may be expected.

The form of even the central cavities will depend very much upon the condition of decay; if it follows the sutures of the teeth, as is often the case in the molars and bicuspids, a simple round cavity is not admissible, for it may have as many branches or prolongations as there are sutures in the tooth. The central may be deep, and the extensions in the sutures shallow.

This will matter but little, if the walls of all portions of the cavity are formed aright.

The next consideration is, How shall the walls of the cavity be formed? Shall they be perpendicular or shall they be beveled, forming a larger cavity within than at the opening of the cavity? Much has been said on this subject, yet I suppose that no one now would contend for an enlargement just beneath the enamel, forming

what is called a neck. The impossibility of properly filling such a cavity is acknowledged by every experienced operator.

I prefer that the walls of the cavity, and particularly the central, be perpendicular, making the cavity as large within as at the opening, but *not* much larger. In cavities of some considerable depth, that shape which would be formed by a pivoting-drill is as near perfection as can be desired.

Having prepared the cavity for a filling, the next step in the operation is the preparation of the gold; and here I lay down this general principle, which is, that everything that can be done out of the mouth, and which will facilitate and make perfect the operation, should be attended to first. In my early practice the custom was to roll up strips of gold foil—a quarter or half of a sheet—into long cylinders or twists, as they were called, fold the end of each into a ball sufficiently large to maintain its position in the bottom of the cavity, then fold in portion after portion until the cavity was full; this method presupposed that the gold became thoroughly compacted and in a solid mass, if not welded together. Many fillings thus put in with Bull's, King's, and now Abbey's foil have stood the test of near half a century, and are truly trophies of dental skill. In manipulative execution they were not very artistic, yet they were honest.

Then as a little improvement on this method, it became the fashion, or perhaps I should say practice, to put together two sheets of No. 6 or 10 foil; then fold until some six or more layers were obtained; then cut into strips in width to suit the size of the cavity to be filled. The object then was to fold and pack in this strip in regular laminated order, and thus secure a perfect mechanical adjustment of each layer of foil. I regarded this as an improvement on the former method, but it was often almost impossible to accomplish this, and to remedy this difficulty I commenced arranging the gold out of the mouth. This led me to the formation of my cylinders in the following manner: I fold my gold—say foil No. 6—four, six, or eight thicknesses, then cut this into strips a little wider than the cavity is deep. I take the strip between my forefinger and thumb, fold the end of the strip on the point of an instrument made from an old excavator filed down to a delicate point like a broach, but of a triangular shape so as to catch and hold the gold while being rolled into a cylinder; then turn the instrument until it takes up as much of the strip of gold as I desire; by a little pressure the cylinder can be made as firm and solid as is wanted. The size of the cavity and access thereto will very much direct the size and hardness of the cylinder. In the manufacture of these cylinders the foil must adhere as rolled, and after the cylinders

are made I usually lay them on a platinum plate warm enough to drive off any moisture; by the time the cavity is formed I expect to know the size and number of cylinders I need. The next thing is proper instruments to handle these; for this purpose I had two special pairs of plugging-pliers made; when closed they represent a straight and curved plugging instrument. The blades are made so as to spring apart wide enough to lay hold of any cylinder needed.

Now, my rubber dam being on, my cylinders being arranged and in place, the cavity dried and ready, I take, say for a lower molar central cavity, the curved plugging-pliers, and with these take first the largest cylinder; place this on end in the posterior part of the cavity, forcing it back against the wall of the cavity; another, next in size, is introduced, and in like manner forced back against this; but it must be remembered (if the cavity is large) that this will not fill out from buccal to palatal wall of the cavity, hence I pack this to one side and the next to the other side, then the next in the center; now, with a heavy strong instrument consolidate these to their place. Then you have the remainder of the cavity to fill up with smaller cylinders, and, if need be, harder ones. All the walls of my cavity being strong, I put in the last piece of gold anteriorly; in this way I keep a perfect view of the operation to the end. If the central cavity is large, with smaller and shallower ones following out the fissures, I have cylinders to suit these and fill them up as I come to them, commencing on the posterior one, if such there should be. In all this we see the necessity for straight or perpendicular walls, so that the cylinders will rest against them without being bent or broken down. We have here a filling made up of continuous layers of gold. The laminæ of gold being kept true and unbroken, less pressure is required to consolidate than by any other possible method. A little experience will determine very soon the proper size and firmness of the cylinders to be used; also their length. If properly consolidated as introduced but little pressure on their ends is of use. While I always pass over a filling to see if it is perfect, yet if proper care is taken in the operation, no place should be found for the introduction of more gold.

The manner of filling all the central cavities is the same, or so nearly the same that a separate description is not necessary. I will only remark that in medium, well-shaped, accessible central cavities, I often fill more than half of the cavity with one cylinder. Make the cylinder hard, and introduce as much as can be properly adjusted at once.

The next classes of cavities in order are the labial and buccal. These, when confined to the crowns of the tooth and surrounded by enamel, so that they can be made into simple round cavities, scarcely

need special description. Since the introduction of rubber dam, they can be filled much as the central, but when caries passes under the free margin of the gum and extends across the tooth from the anterior to the posterior approximal face of the tooth, a much more difficult operation presents itself. To make this as brief as possible, let us take say a lower molar. The decay presents in the center, the size of this o—running very much the same across the neck of the tooth. Take a drill the size desired, and drill a hole at each extreme of decay as if for separate filling, pointing the drill, however, so as to widen the inner circle of the cavity, leaving a good strong wall which will be formed by the approximal surfaces of the teeth, then cut or drill out the decay between these openings. You now have a cavity, the outer circle of which is a good deal larger than the inner; now take a cone-shaped drill and enlarge within both extremes of the cavity. I frequently bevel inwardly the gingival wall or border of the entire cavity; this part of the cavity is often not much more than half the depth of that portion surrounded by enamel, and hence requires shorter cylinders. I commence the filling of such a cavity posteriorly, using first a cylinder suited to the gingival wall, yet long enough to receive the next, which is placed, as it were, on the top of the first. If the cavity is not very large, I make my first cylinder as large as will enter the cavity and pack back against the posterior wall; consolidate and fill up as much of the cavity as was first formed by the drill, using this as a wall to build against in the further operation; now use cone-cylinders, until the anterior portion is reached, then such as may seem to be needed. I sometimes fill the anterior part of the cavity immediately after the posterior part, then finish the central portion with cones. I wish the enamel border of such cavities well formed, and, if anything, slightly enlarged within, and with a spear-pointed plugger wedge in under this all the gold that can be packed in from a strip of gold. I have sometimes circled half way around a tooth in this way.

In finishing up a filling of this kind, I file off the ends of the cylinders, and grind them down with an emery-wheel or bur until the shape of the tooth is restored.

Even the rubber dam has not enabled me to modify my first method of filling some of these labial cavities with cylinders, particularly in the upper front teeth. This is where the caries extends much under the free margin of the gum. I wish to retain the integrity of the gum, and hence disturb this as little as possible. I shape the cavity under the gum slightly beveling, that is, enlarging a little within without necking, and as deep as circumstances will permit; then dam around with bibulous paper, covering the tongue, etc., with a napkin; with astringents wash out the cavity

or check dripping from the gum; then place the first cylinder up under the gum, having it as large as can be well introduced; force it to its place; the shape of the cavity will hold this to its place and enable the filling to be finished without further trouble.

I have selected these two special conditions of labial cavities, thinking they embrace all the general directions which come under this head.

The next cavities in order according to classification are the approximal, yet in their importance and frequency they might well be placed first on the list. I presume they embrace far more in number than all the rest.

There are quite a number of circumstances and physical peculiarities of the teeth to be taken into consideration before I describe my method of filling these cavities with cylinders, such as the natural formation of the tooth to be filled, the age of the patient, the crowded condition of the teeth, extent of decay, etc.

The question might be asked, At what period of life are we most frequently called upon to fill the superior incisors on their approximal surfaces? I am satisfied that in a majority of cases when these teeth decay on their approximal surfaces, they commence before the twelfth year.

What are the conditions which would demand the use of wedges instead of the file?

If the decay has progressed so that the edges of the enamel have become brittle, the file is certainly indicated, and if, when this has been used, the space obtained is sufficient for the proper introduction of the gold, wedging is not necessary. If the teeth are much decayed and overlapping each other, and the use of the file would relieve the deformity, it is again indicated; but if, when this has been used so that the object is accomplished, and the enamel around the border of the cavity is firm and solid, and the space is not sufficient, the use of the wedge is indicated. If the decay is small and has not injured the appearance of the teeth, wedging is certainly most appropriate.

If the teeth are small at the neck, and only pressing against each other at their points, and these are sound, the wedge is strongly indicated. I have thought that this particular condition of things more strongly demanded the wedge than any other.

The age of the patient, the character of the teeth, the kind of caries, the density of the dentinal structure, and the crowded condition of the teeth all control us in the treatment of approximal caries.

It is not necessary to speak of the kind of wedges to be used. It is the space to be obtained which interests us most. This should be such as to give free access to the cavity.

"In the further consideration of this subject, I will first take up the preparation of these cavities in the superior incisors and canine; and first let us take a view of the approximal faces of these teeth, so that we shall have a proper idea of the form which the cavity will necessarily assume, particularly if the decay is at all extensive, and the separation of the teeth will demand the use of the file. In a majority where the separation is obtained by wedging, the cavities can be made round or nearly so, but when the decay is extensive, commencing near the gum and extending to near the point of the tooth, we shall have a shape of cavity, somewhat resembling the side-view of the tooth itself. We have here wedge-shaped teeth, the palatal plane, however, far more beveling than the labial.

"The cavity then must assume this shape, having its base next the gum, and the cone corresponding to the cutting-edge or point of the tooth. The manner of separation will affect also the interior arrangement of the cavity. If, for instance, the teeth have been separated with a file, and the palatal portion most cut away to preserve the labial appearance of the tooth, we shall have a depth of cavity on the palatal not at all equal to that on the labial line of the tooth. This condition of things is that which is most desirable, so as to effectually preserve the appearance of the tooth, and hide from view the filling.

"The internal arrangement of these cavities I aim to get of the following order: the labial and palatal walls straight, merely carrying them in as it were the breadth of the cavity at the orifice, but the cervical wall I slightly enlarge as it extends in towards the center of the tooth; the point under the cutting-edge of the tooth should also take somewhat this shape.

"In this way all the healthy dentine which can be, should be left to strengthen the labial and palatal border of the cavity."

Let us take next a view of the approximal cavities between the bicuspids and molars. Say we have decay between the bicuspids (superior), and also between the molars; we have decay on both sides of the anterior molar; also on both sides of the posterior bicuspid. The caries is not so extensive but that we can fill all the teeth, and they are not so crowded but that we wish to save all. The extent of caries, the form of the same, the form and position and occlusion of the teeth, particularly of the bicuspids, will very much control the form of the cavity. As an illustration let us take a distal cavity in the posterior bicuspid. The inner cusp is shorter that the outer, and hence the labial wall will be longer than the lingual. The enamel forming the wall of the cavity on the grinding-face of the tooth is strong and good. We wish to save as much of the labial face of the tooth as possible; hence we make as little space here as

we can, leaving as much of the natural configuration of the tooth as possible. The cervical wall is prepared as described in the labial cavities; slight undercuts are made under the outer and inner cusps. We cut away with the chisel the inner cusps and perhaps some from the mesial face of the molar until we have free access to the cavity. Owing to the cutting away of the palatal wall this portion of the cavity will be less in depth than the labial, but neither of these walls need be other than straight and parallel with each other. Now, my rubber dam being in place and cylinders formed to suit the cavity, I take a wedge of hickory wood made to fit the space at the neck of the teeth, and drive it in tight just above the edge of the cervical wall, or, if it comes below this a little, I bevel this edge of the wedge so that it will not be in the way of the first cylinders introduced; sometimes, indeed, this is made to hold in place the first cylinders. The shape of the cervical wall is such that pressure on the cylinder draws the gold into the cavity, whereas, if the cavity were differently shaped, the oblique pressure might incline to draw the gold out. Having secured my first gold in place I add cylinder after cylinder, as in any other cavity, until I come to the undercuts made at the cusps of the teeth; here my last cylinder is necessarily small and a portion of the strip of gold is left to it, and with a sharp-pointed, suitably curved plugger I wedge in all the gold I can. I generally fill these cavities in this way, finishing under the labial cusps, yet sometimes it is more convenient to finish at the palatal. My experience has been that after two or three cylinders are properly inserted and somewhat consolidated the balance of the operation is very easy. In large fillings I call in the assistance of a malleter, but always put my gold just where I desire it before the mallet is used.

In many cavities very accessible the first cylinder may fill, when consolidated, one half of the cavity. The arrangement of the gold is such that much less force is necessary to consolidate than by any other method.

I presume it is not necessary to give any special description of the palatal cavities. The general method and principle is the same.

In my description thus far I have selected some of the most difficult cavities of the kind to fill. The approximal cavities in the incisors are filled just as those in the bicuspids, only finishing at the cutting-edge of the tooth.

I have no doubt some will say these are all simple cavities, but how fill some of the compound cavities by this method?

Let us take a distal cavity of the posterior molar (superior) compounded with a central. Here is a large compound cavity. We have no necessity for cutting away much of the tooth for room; we

only cut away the frail border, which it is unsafe to leave. The distal cavity is much the largest, and extends up to the free margin of the gum. The central reaches as near the pulp-chamber as may be without an exposure of the pulp. I form my approximal cavity as before, also the central, but the space between these I cut away to make the cavity fully as large within as at the opening.

I commence my filling here at the cervical wall, filling up to the bottom of the central cavity; now, if the cavity is deep and large, take two or three long cylinders, extending them through, covering the bottom of the central cavity; then fill this with cone-shaped cylinders, filling up the space between; let these be long enough to restore the shape of the tooth.

If the cavity is broad and shallow, make two retaining-points in this space, and fill with cohesive gold.

It will, I think, be easily seen to what extent cylinder fillings may be carried, and the possibility of making many contour fillings by this method. Still, where teeth are much broken away, and I wish to restore them to original form, I use cohesive gold.

I do not think it necessary to use soft foil in all cases of cylinder work when the walls of the cavity are strong; I often use cohesive gold in this way: I want my foil to be somewhat adhesive, that is, adhering together when rolled.

I feel that in presenting this subject to the New York Odontological Society, it is not necessary to specially describe all the different conditions we meet with in the cavities we have to fill. I know the members of the society are too well posted in their profession to be instructed by anything I can give them.

I found that to carry out the plan of the original address written for the Mississippi Valley Association in 1850 would make this article far too long. I have therefore abridged as much as I could, conforming the description of the operation to that given at that time.

I claim no superiority for fillings of this kind. I only say that two-thirds of the fillings we insert can be made just as good this way as by any other, and I cannot see the propriety of spending two or three hours in filling a tooth which can be as well filled in one hour or less.

The finishing up of these fillings is, I suppose, in almost every particular the same as of any other kind. In approximal fillings, use the file, emery wheel, and cutting instrument as in any other case.

Of late years I do not as often as formerly make the V-shaped spaces. In crowded dentures in young patients, when decay is between the posterior bicuspid and molar and the occlusion of the teeth is not fixed and will permit, I make very free separation.

Discussion.

Dr. Rich. I am surprised to hear a paper like that from Prof. Taylor. If there could be any plan devised for making imperfect fillings it would be just that one, provided cylinders are made as he says they are to be made. The force needed is such as should hardly ever be used upon a tooth to make a solid filling with cylinders. The method of cylinder filling is an old idea. The first I saw of it was presented in the Dental Society of the City of New York in 1847, by Dr. David M. Park, perhaps one of the best dentists who ever lived. I was associated with him in practice at one time, and he used that method of making and using cylinders. We had not cohesive foil in those days, and I demonstrated to him that it was impossible to make solid fillings in that way.

Dr. Brockway. Did he make saving fillings in that way?

Dr. Rich. He did, in some particulars; yet I considered it the way to make more defective fillings than by any other method. It is almost impossible to get a filling formed by cylinders in a solid mass; working the gold around a broach makes it stiff and stubborn, and it is almost impossible to get a solid mass with it in that condition. Cylinders may be made loose so that they can be forced, but Prof. Taylor says he wants them closely rolled.

Then the gold must be quite hard when he uses it. In that condition you would get in every roll many little angles into which it would be impossible to force gold. The mechanical construction of such a filling is defective. Dr. Park was very enthusiastic over this method. I said to him one day that he could not make a tight filling in that way and that I could demonstrate to him that he could not. He wound his cylinders on a five-sided broach, using Bull's gold. He had a broach made from an ordinary watch-maker's broach, having scarcely any taper, and the layers of gold came close together, making a cylinder as solid as could be wound in that way. A filling made in a hole in a bar of steel when put over the hole of the receiver of an air-pump allowed water to pass through it.

If it is advantageous to have a tight piece of gold filling a cavity, you can not make it by cylinders in that way. If the cylinders are made soft, so you can press them into any shape, it may be possible, and it may be a convenient way to introduce gold in some cavities. There is a way that you may possibly make a filling solid. Make a cylinder the length of the depth of the cavity, and after putting it in the cavity unroll it until the outside of the roll touches the walls of the cavity, then fill in between the coils, and I think you will have a solid filling always.

That was the method I adopted at that time. I sometimes filled

cavities that had only two walls by making a coil of the depth of the cavity, and then unwinding and fixing it in place, and bracing the outside of the coil towards the walls of the cavity. That had never been done in that way before. But you will find that mode of forming fillings from cylinders made in the way Prof. Taylor describes is an exceedingly defective mode of making them, if it is an advantage to have the fillings solid.

Dr. Clark. Dr. Rich has certainly thrown some light on this subject to me. I think Dr. J. S. Clark introduced cylinder fillings in New York about 1854. I know I used them as far back as 1852. I think some of the best fillings I ever made were made of cylinders.

They make a saving filling. I can look back to the time when I saw these fillings fifteen or twenty years after they were put in, and the teeth were saved. Can we say as much for the majority of fillings that are now inserted? We can not say much more. With Dr. Rich, I should expect a failure in every filling almost, were I to adhere to the plan laid down in this paper. I should not know how to put in a filling of cylinders by the way in which it is described there.

To use cylinders successfully it is necessary that the gold be absolutely soft. If there is any cohesion to it you cannot make a perfect filling. I think that Dr. John S. Clark was the first who publicly advocated the use of cylinder fillings here. The first notice I ever saw in regard to it was published in his journal. He certainly deserved the credit of introducing them, at least.

Dr. Rich. I am only speaking of the filling formed of hard cylinders made in this way. The formation of the cylinder in the first place put in any cavity except a round one is absolutely incorrect. Dr. Park originated that system of cylinders. He was secretary of the local society here at the time, and was a very intelligent man, and his mode of filling was well known to all the dentists of New York, and it was well known that it originated with him. I spoke to Dr. Clark when he made this public before one of the meetings of the society, I think in Philadelphia, and told him about Dr. Park having filled in that way, and he said he had never heard of Dr. Park. It is an undoubted fact that Dr. Park filled that way in '46 and '47. I spoke to Dr. Clark I think in the year of the formation of the American Dental Society at Philadelphia.

Dr. LaRoche. It was in '54, the year after. I heard Dr. Rich describe his mode of making a cylinder at the same time.

Dr. Rich. I merely described Dr. Park's method. Dr. Park was a thoroughly scientific man, and any mode of practice he described in any way was listened to with great attention. He was an A.M., a graduate of Union College, and was one of the ablest natural philosophers Dr. Knott ever turned out. He turned to the practice of dentistry.

He was a mechanic in every way, and this construction of cylinders was original with him. With Dr. Taylor's cylinders it is very hard to make a solid filling; I believe it almost impossible.

Dr. LaRoche. I do not think it possible. I have used cylinders since 1854, and Dr. Clark was my first preceptor, but I do not believe in preparing them as described in the paper. I have had some cylinders made in the last three or four years, using very thin foil rolled round a broach. I use cylinders almost always in all approximal cavities to start a cavity with. I think Dr. Bronson has used them in the same way for a good many years.

Dr. Brockway. You place them at the cervical wall?

Dr. LaRoche. Yes, sir; it is convenient and saves much time.

Dr. Clark. Can you make a solid filling under any circumstances?

Dr. Rich. By packing small particles of cohesive gold together you can get a filling you can draw out in wire. That is pretty nearly solid. You cannot get water through it.

Dr. Clark. Some of the prettiest fillings I ever saw came from the hands of Dr. Rich, but I remember now that they did look as though they had had the small-pox. I do not think they were put in by cylinders. Cylinder fillings will not look that way. They never look pock-marked. If a man is in the habit of using cylinders he will put in good fillings.

Dr. Rich. I do not use cylinders much. Anybody is likely to have pock-marked fillings. That results from moisture getting between the layers of gold when you are putting it in. I have seen mouths before we had the rubber dam that would exude moisture over the whole surface of the palate. Large drops of moisture would stand thickly over the whole surface. It is impossible under these circumstances to keep the patient from throwing a stream of warm water with the moisture which will condense on the gold. Pock-marked fillings are not the result of inferior manipulation, but of moisture getting between the layers of gold. I endeavored in my practice to use gold in what would be a philosophical manner, and I object to the cylinder for the reason that it is absolutely impossible to make a solid filling with it. I can demonstrate that at any time; it is absolutely impossible.

Dr. Perry. I believe we understand that Dr. Rich aims at a solid, homogeneous gold filling. He endeavors to make them of uniform density throughout. I wish he could establish the common-sense of that method as applied to teeth as we find them; I do not think it is quite correct when applied in actual practice. It is all right enough where we want to get strength, but to be applied as a principle I cannot see that he is right. He is nearly always right in all that pertains to the art of filling teeth, but in this I think he is wrong.

Dr. Rich. If you will point out where I am wrong. I will argue the question. The impracticability is another question. I started in the early part of my practice with the principle that a filling should be made homogeneous from the bottom of the cavity to the top. I am not boasting when I say that it was not more than a year before I became the first dentist in the world on that principle. Every dentist acknowledged that. Dr. Eleazer Parmly said to me: "How do you do such work as that?" Many others said the same. I did it on a principle different from what they did; I made my reputation on that principle, and it is a good reputation to have. It is not impossible in any case.

Dr. Perry. I will grant you in most cases it is possible, but what does the Good Book say about all things not being expedient? We work in the mouths of sensitive creatures, and to save teeth, and we want to do it in the best and at the same time the easiest way we can. We have all seen thousands of cases where teeth were filled with soft gold and were saved, yet none of the fillings were solid and homogeneous throughout. The homegeneity of the filling, when applied to contour fillings or where strength is required, is not a question to be argued at all. Such a condition is indispensable. But to be applied as a principle in all mouths I do not see how you can justify it.

Dr. Rich. A filling that adheres to the walls of the cavity in all parts, and is solid there, must be safer than one that is liable to be moved, and soft fillings are always liable to be moved when the gold is being put in.

Dr. Clark. Would you venture to say you can put more cohesive than soft gold in the same space?

Dr. Rich. Certainly,—more weight. The principle that I adopted in the early part of my practice was that every particle should be in absolute contact with its neighbor. I early discovered the method of making gold cohesive or otherwise; and after a long practice I cannot see any defect in the use of gold on that system.

Dr. Perry. It is just here. Your gold must be put in in small pieces and the operation consume much time. After a few years, unless you are an accomplished operator and use great care, your teeth will look more or less blue around the fillings. If you will apply the same delicate care with soft or semi-soft gold you will get a better adaptation to the walls without consuming nearly so much time. Dr. E. J. Dunning used soft gold and it is not common to find soft spots in his fillings. The accuracy and determination of the man was shown in the fillings. Parts of a cavity can be filled with soft gold in such a way as to be sufficiently homogeneous, and with a little greater certainty of getting a closer fit.

Dr. La Roche. I do not think the burnisher is used as much as it ought to be used by most dentists.

Dr. Brockway. It is against the law, according to some authorities.

Dr. Jarvie. It seems to me that the absolute solidity of a filling is not the most desirable point. What we want in order to save teeth from further decay is perfect adaptation to the walls of the cavity, and a sufficiently solid surface to resist any force that may be brought against it. It makes no difference if there is a hole in the center of the plug, provided you have the plug perfectly adapted to the walls of the cavity, and I think a great deal as Dr. Perry does, that a perfectly homogeneous mass in the cavity is not necessary to preserve the teeth.

Dr. Brockway. In my judgment it does not matter whether a filling is as hard as it is possible to get it, or whether it is a little less hard than that, or considerably less hard, so long as it is hard enough to stand the requisite wear, and has perfect adaptation to the walls of the teeth.

Adjourned.

PENNSYLVANIA ASSOCIATION OF DENTAL SURGEONS.

REPORTED BY THEODORE F. CHUPEIN, D.D.S.

A MEETING of the Pennsylvania Association of Dental Surgeons was held on Tuesday evening, November 8, 1881.

The subject was "The Treatment of the Dental Pulp."

Prof. Buckingham said that he did not propose to advance any new mode of treatment, but he desired to compare notes with others. Up to the year 1840, when a pulp was exposed the only treatment known and practiced was extraction of the tooth. After this period the devitalization of the pulp was practiced by actual cautery, and the lost crown was replaced by a pivot tooth. The actual cautery was so severe that other means were resorted to, and lunar caustic, caustic potassa, oil of cloves, and creasote (which latter was discovered in 1834) were successively tried. From this time to the year 1850 all the teeth in which pulps were exposed were either pivoted or extracted. It has lately been said that Dr. Arthur advised the leaving of decay in the cavities of teeth; but he knew that Dr. Arthur was a very careful operator, and he only advised leaving decay in a cavity when by removing it the pulp might be exposed. This is further substantiated by reference to his writings in the periodicals of that time. The discovery by Spooner of the effect of arsenic to destroy the pulps of teeth gave new activity to this operation. Arsenic alone, or combined with morphia and formed

into a paste with creasote, is now, as at that time, the principal devitalizing agent. With the devitalization of pulps a new departure was inaugurated, which was to try to save all pulps alive. All admitted that a tooth with a live pulp in it was infinitely better than a tooth with a dead pulp; and consequently all kinds of plans were proposed and practiced to cap the pulp and keep it alive.

He thought the pulp tolerated gold in contact with it as well as any other material, although innumerable articles had been used as cappings, such as the shavings of goose-quill, cork, lead, gold-beater's skin, skin of the egg, wax, convex pieces of gold plate, etc. Not content with saving healthy pulps alive, some men went to extremes and said they even saved diseased pulps, amputating the diseased part from the healthy and saving the tooth in this way. An eminent dentist of Chicago said that in such cases he cut a V-shaped plug out of the diseased pulp; then brought the flaps together, and healed the organs in this way. How he did this he left to the imagination of his wonder-struck hearers. After a long season of capping pulps, the oxychlorides came into use, and wonders were said to be performed by them. It was thought to be "just the thing," but this idea too fell through when time showed that what was thought success proved to be failure, or in the large majority of cases only a mummification of the pulp through the action of the oxychloride of zinc. We seem, therefore, to be no further ahead to-day in successfully capping exposed pulps than we were at the start, some twenty-five or thirty years ago; so that the inclination of the profession seems to be that when a pulp is exposed, the best thing to be done with it is to devitalize and remove it as thoroughly as possible from the roots, and to fill these and then the crown. The operation of removing the nerve from the roots of teeth gave us a world of trouble. In some teeth, or some roots of teeth, it was entirely impracticable; thus the buccal roots of the upper molars, the hour-glass-shaped roots of the bicuspids and lower molars defied all attempts at removal even after the most patient and persevering effort. If one took a lower molar tooth in his hand and opened the cavity of decay to the root and made the attempt, his drill would most likely pass through the side of the root. Judge, then, of the greater difficulty when such a tooth was in the mouth, and the access to it offered new difficulties. He did not think it was necessary to take out all the dead nerve up to the apex of the root. There was a constricted part in all roots at the apex where the nerve was so small that no instrument made was small or fine enough to reach it. Dr. Atkinson, of New York, said, however, that where the nerve-canal was not large enough for the instrument to remove all the nerve, it must be made so, and he recommended drilling through

the root and filling to the apex. He had heard of the operation being done and of measuring the depth by passing a hooked instrument through the root and marking it as a gauge, so as to tell how to seal up the orifice without permitting the bushing to extend beyond the end of the root; but he must say he had never been able to perform such an operation. Various materials had been advised to fill roots with, such as cotton-fiber, silk, shellac varnish, oxychloride of zinc, gutta-percha, gold wire, gold foil, etc. At the last meeting of the American Dental Association Dr. McKellops recommended liquid gutta-percha as the best root-filling he had as yet tried, and it seemed to him (Dr. B.) a good plan. He introduced it by pumping it in small quantities into the root until it was thoroughly filled, when by the rapid evaporation of the chloroform the material was left in the root comparatively solid. Such, then, seemed to him to have been the opinion of the profession at various times in reference to the pulp and to its treatment. Shall we then destroy all exposed pulps? The pulp will sometimes tolerate gold next to it. He knew this from his own experience. He recollected in his own practice of having wounded the pulp in excavating a cavity in a cuspid. He touched the part with creasote, covered it with gold foil, and filled with gold. Five years after he had to remove this filling, when he found the pulp alive, bleeding again on the cavity being further prepared. He was much censured at the time for making the experiment. Sometimes a pulp will live under almost any circumstances; at other times it will inflame under the most careful treatment, and give pain on the least exposure to heat or cold, acids or sweets. He would like to ask if any one had ever seen a case of secondary dentine forming at the point of exposure of a dental pulp under a capping of any material. He spoke of the place creasote had held so long as a vehicle and as an obtundent, disinfectant, etc., in dental operations. He thought that when used on an exposed pulp it had a soothing and not an irritating effect, and the coagulation of lymph which followed the application was slow and gradual, producing a healthy action and preventing trouble for a long time. He spoke of a pair of flat-nose pliers which he had devised to make nerve-extractors with. It was made by simply reducing one nose of the pliers to a knife-edge, when the instrument could be placed between its jaws, and the fine end bent over in the form of a hook, and then suitably tempered.

Dr. F. M. Dixon said that no other subject had for him so much interest as the treatment of the dental pulp, as no other was likely to give so much trouble and anxiety to both patient and operator, and of the two he thought, in the majority of cases, the operator had the worst of it. He regarded the treatment of the dental pulp often

equal to the most difficult operation in general surgery. He had known of complications arising in its treatment which had terminated in death, and instanced two cases in his own early practice. One case after treatment terminated in alveolar abscess, which was treated by the patient's family physician, and death from erysipelas resulted. The other case was that of a lower bicuspid similarly treated. The patient took cold while out skating; inflammation set in, and the young man was allowed to choke to death—a result which could have been avoided by extraction of the tooth. He thought success in pulp-treatment depended very much upon the condition of the patient at the time the operation was performed. He thought it best always to save the pulp alive when this could be done, and it was our duty to take any amount of trouble to accomplish it, but in his opinion it is only practicable when the pulp is in a healthy state. He regards it as useless to attempt it if there is the least congestion. If the pulp be healthy, though exposed, the patient healthy, and kept so during treatment, capping the pulp may prove successful; but with all circumstances in its favor the chances of failure are greater than the chances of success. If the pulp be not in a healthy condition the best thing is to get rid of it. There are frequently certain little pockets, constricted portions or depressions into which the pulp may be pushed before the nerve-broach when clumsily introduced. The removal of the pulp entire is a most delicate and difficult operation, and if unskillfully attempted the dead nerve will be surely forced before the nerve-broach and driven into the inequalities of the nerve-canal. In introducing the barbed nerve-broach a fair, clear, direct, and accessible approach should be made and the broach introduced with the barbs pointing to the dentine or wall of the canal and the smooth part toward the nerve. It should be steadily pushed upward (or downward as the case may be), always with the pressure towards the dentine, until the broach reaches the end of the canal, or as high up as possible without fastening it in the small part of the canal, before a twist to the broach is given. In this way several of the barbs engage the nerve, when it can generally be brought away entire.

Dr. W. H. Trueman thought much practical good might result from relating our daily experience in cases of this kind, so he had made a few notes. How much of the ideal can we put in practice at the chair? His practice is if the pulp gives pain always to destroy it, even if the tooth had ached for only an hour. He does this as the shortest road to the end, for his experience is that if the attempt to cap the pulp is made, trouble is almost sure to follow. He destroys the pulp as follows: He grinds up a little arsenic on a slab with a little creasote and glycerin, and when mixed to the right

consistence adds a little oil of roses. This pleasant odor overcomes the disagreeable one of creasote, and disarms the fear of the patient. The duration of pain from the application varies. He allows the arsenic to remain in place forty-eight hours, when he removes it and seals up the cavity, allowing it to remain so for two or three weeks. To remove the pulp he prefers the barbed broach to the hooked bristles. The former takes a better hold on the pulp, while the latter are more apt to jam into the root or tear the pulp away in pieces. After the pulp is removed he uses simply cotton and creasote as a root-filling. He objects to gutta-percha as a root-filling, either by softening and introducing with heated instruments, or in the liquid form, as there is no certainty that you have the root well sealed at the highest accessible point; besides, once introduced it cannot be removed, except at a great expense of time and trouble, while with cotton, should the case give trouble, the cotton may be removed and treatment renewed. He knew of a case where a root-filling of cotton had remained in the tooth ten years, and on its withdrawal the odor of the creasote was still perceptible and the cotton clean. In his own tooth, in which a root-filling of cotton and creasote had been inserted twelve years ago, on its removal in the early part of this year, Dr. Webb, who refilled it, observed and brought to his notice the odor of the creasote still on the cotton which he removed from the end of the root, and which was perfectly clean. After filling the roots thus he inserts a trial filling, and allows all pain and soreness to subside before inserting a permanent filling. To cap an exposed pulp he mixes a little of the dry oxide of zinc with a little chloroform, and carries this to the point of exposure. The chloroform soon evaporates, and leaves the nerve well covered with the dry powder; over this he flows a little thin oxychloride of zinc. This sometimes gives pain, but the dry powder which covers the exposed pulp prevents it to a great extent. When this hardens he either fills with more oxychloride mixed thicker, or with some other material. He has no opinion of gutta-percha as a material for capping pulps. He used it in a number of instances, but invariably found the nerve dead under it, and the material entirely disintegrated. If it acted thus as a capping, what reason had we to expect that it would behave better as a root-filling? He would like to learn how to tell when a pulp was exposed by some infallible means, as also how to tell for certain when a pulp was dead or alive.

Dr. James Truman thought no conclusion had been reached relative to the treatment of the dental pulp. Thirty years ago Dr. Maynard introduced to the profession his plan of removing the pulps of teeth from the roots by means of barbed instruments. At that time oxychloride of zinc, as a capping for exposed pulps, was not known,

and only metals were used. What is secondary dentine, and how is it produced? It was simply a substance issuing from the dental pulp, caused by an irritation of that organ. In primary dentine the tubes were regular; in secondary dentine they were irregular. The German dentists and histologists deny that secondary dentine is ever produced or ever found under a pulp-capping. A large proportion of cases of pulp-capping result in failure, and even in those claimed as successes it is because the comfort which is felt after a capping of oxychloride of zinc is from the mummification of the pulp by the action of the oxychloride. He is not particular about getting out every particle of the pulp, yet tries to get out all he can. In certain teeth, to remove all the nerves from all the roots is an impossibility. The upper lateral incisors are the most difficult of the front teeth, on account of the flattening of the roots of those teeth. We cannot apply arsenic with any certainty of good results to an irritated pulp. The irritation must first be overcome by antiphlogistic treatment. He related a case of a young student who, from a wrong diagnosis and the application of too much arsenic, was involved in a law-suit brought against him for malpractice. It was better to let the pulp die without arsenic than to use it. He used arsenic always in fear and trembling. A quantity the size of a *pin's head* was *too much*, the *smallest* possible quantity was enough—an *invisible quantity* was enough to do the work of devitalizing a pulp.

Dr. F. M. Dixon, explaining his remarks in reference to the formation of secondary dentine, said he thought that in the case of an exposed pulp, if the exposure was but slight, under favorable circumstances, in a good, healthy patient, the point of exposure might be bridged over by an exudation of lymph from a healthy pulp.

Dr. Buckingham would like to discuss this subject of secondary dentine, because some of us differ in the understanding of what is primary and what is secondary. Secondary dentine grows the same as primary dentine, but the one is a natural growth, the other a growth caused by irritation. Regarding the filling of the pulp-canal he had used oxychloride of zinc quite thin, carrying it in this condition well up into the root, and depending on its hardening and forming a solid root-filling. In capping exposed pulps he had had the best success with the oxide of zinc with creasote over the exposed point, and then filling over this with oxychloride or oxyphosphate of zinc.

Adjourned.

VERMONT STATE DENTAL SOCIETY.

THE sixth annual meeting of the Vermont State Dental Society will be held in the parlors of the Van Ness House, Burlington, Vt., March 15, 16, 17, 1882.

CHAS. F. LEWIS, *Secretary.*

MICHIGAN STATE DENTAL ASSOCIATION.

THE Michigan State Dental Association will meet March 29, 1882, at 7.30 P. M., at Detroit. A full attendance is not only desired but expected. This being the quarter-centennial of the association, it will be celebrated in a fitting manner. A history of the association is being compiled. The third and last day will conclude with a grand banquet in the evening. E. C. MOORE, *Secretary.*

ALABAMA DENTAL ASSOCIATION.

THE Alabama Dental Association will hold its next annual meeting in Montgomery, Ala., on Tuesday, April 11, 1882. A large attendance is expected, and every dentist in the State is earnestly requested to be present, as business of importance to all will be transacted. All dentists in good standing are cordially invited to be with us. Hotels and railroads will give reduced rates to all attending the meeting.

The State Board of Examiners will meet at the same time and place. All who have not procured license to practice in this State will report promptly on the first day of the session.

T. M. ALLEN, *Secretary.*

PENNSYLVANIA STATE LAW.

THE committee upon enforcement of the law to regulate the practice of dentistry in the State of Pennsylvania, have reason to believe that while some violators of the law endeavor to shield themselves behind bogus diplomas and untruthful statements, there are others, who, ignorant of the requirements of the law, are innocent of any intention to defraud or do illegal acts, but, nevertheless, are subject to indictment and fine whenever any person chooses to make information against them.

We therefore request each dentist in the State to obtain and forward to the chairman of committee the name and address of each man known, or for good reasons supposed by him, to be practicing dentistry at this time in this State in violation of the law.

Printed copies of the law can be had by application to

W. E. MAGILL, *Chairman*, Erie, Pa.

EDITORIAL.

SYPHILIS.

In an address entitled "The Prevention of Syphilis," prepared at the request of the Philadelphia County Medical Society, and recently read at one of its meetings, by Dr. J. William White, some statistics are given with reference to the great prevalence of this disease. The reliability of the statements cannot be questioned, and they are well calculated to excite the anxiety of sanitarians and philanthropists. It is only necessary to refer to its acknowledged depraving effects in the production of cachexia in the offspring of those affected to establish the claim that in addition to its being the most widely diffused, it is the most serious, in its immediate and remote effects, of all the ills that flesh is heir to—not only following its victim to the grave, but perpetuating its vicious influences to succeeding generations.

It is not our purpose to discuss the significance of the signs in the dental structures which it has been claimed are pathognomonic of hereditary syphilis, nor the effects on the teeth directly and indirectly of acquired syphilis; but if, in its most virulent forms, it is capable of destroying the lives of a vast majority of children affected by it before, at, or soon after birth, and of causing deformity and imbecility in thousands brought into the world under its influence, it is easy to conceive that its less pronounced manifestations may be in the so-called scrofulous, cancerous, or tuberculous diatheses; certainly in the production of stomatitis of all degrees, with all its dire effects upon the mucous and osseous tissues of the body. If it is capable of producing gummata, keratitis, choroiditis and retinitis, epilepsy, apoplexy, amyloid degenerations of various tissues, and hypertrophied, ulcerated, or necrosed bones, it would be passing strange if its influence did not extend to the dental structures.

That syphilis, if at all potent in causing degeneration of vital tissues, must be responsible for no small share of the prevalent indications of a degenerative tendency in the teeth, is evident from Dr. White's estimate that nearly two millions of the population of this country are at present infected with some form or phase of syphilis; that there are in New York City, at any one time, from sixty to seventy thousand venereal cases,—about one in every fifteen of its men, women, and children; that in the city of Philadelphia, including the hereditary with the acquired form, not less than fifty thousand people are at any one time affected with the disease, and that, from calculations based upon known facts, thirty thousand males are daily infected with venereal poison in the cities of the United States; and

that, by means of its many forms of inoculation and transmission, it is rapidly spreading still further.

If these figures approximate the truth (and they seem to be abundantly justified by the statistics of other countries), it is high time that radical measures were adopted to control and restrict the spread of this disease. Certainly there is urgent need of a more general and more accurate knowledge concerning the gravity and the prevalence of syphilis, and of the varied possibilities of contamination from unsuspected sources which surround every individual.

CURIOUS OBSERVATIONS.

In the January number of the *United States Medical Investigator*, a homœopathic journal published in Chicago, appeared a translation, by T. M. Strong, from the French of M. Parrot, of Paris, of an article on the effects of hereditary syphilis upon the teeth. The author or the translator seems to have been somewhat at sea with reference to the effect of syphilis upon the *bicuspids of the first dentition.* We make the following extracts from the article, which occupies fourteen pages of the journal:

"There is not a tooth which is free from its attacks; but it is especially observed upon the bicuspids of the first dentition and the first molars."

"When caries destroys, in certain subjects, the bicuspids and sometimes the canines of the first dentition, it probably gives rise to a consecutive atrophy of the maxilla and alveoli which contain the teeth of the permanent dentition, so that later a wide interspace exists between the first molars and the permanent incisors of the lower jaw."

"The following order may be adopted as of relative frequency in the atrophy of the temporary dentition; first the canines, then the second bicuspids, next the first bicuspids, and finally the lateral and middle incisors. As you will notice, this succession is precisely the inverse of that of the eruption, and we can say that the teeth which appear the last are the most frequently and the most extensively attacked."

"The atrophy of the bicuspids is usually accompanied by that of the canines, while the atrophy of the incisors is almost always isolated. The study of the etiology will give us the reason for these peculiarities, and will show us that they depend upon the evolution."

"The disease does not always remain isolated in the two dentitions, for in a certain number of cases I have noticed the effects at the same time upon the bicuspids of the primary and upon several teeth of the permanent dentition."

DENTAL DEALERS' CONVENTION.

A CONVENTION of dealers and manufacturers of dental goods was held in the city of Pittsburgh, Pa., on the 8th and 9th of February, 1882, in pursuance of a call issued by a number of dealers, for the purpose of securing harmony in the trade, and of dealing justly with customers by adopting a fair and equitable one-price system.

J. Littlefield, of the house of Codman & Shurtleff, Boston, was elected president, and Lee S. Smith, of Pittsburgh, secretary.

A permanent organization was resolved upon, and a committee was appointed to perfect the details thereof.

Resolutions were adopted looking to the regulation of prices and to business intercourse between the members of the association.

The utmost harmony and good feeling prevailed, and the convention adjourned to meet at the call of the Committee on Permanent Organization.

The following houses were represented:

Lee S. Smith; W. M. Herriott; Ransom & Randolph; Cogswell & Gee; Spencer & Crocker; George W. Fels; L. J. Frazee; Buffalo Dental Manufacturing Co.; H. J. Caulkins; J. R. Tantum & Co.; A. M. Leslie & Co.; The S. S. White Dental Manufacturing Co.; H. D. Justi; Chicago Refining Co.; Gideon Sibley; C. B. Woodworth & Co.; J. L. Brewster, Jr.; Hood & Reynolds; J. B. Dunlevy; Lukens & Whittington; Codman & Shurtleff.

Letters were read from a number of parties who were unable to attend the convention, expressing their hearty accord with the objects set forth in the circular of invitation.

TWO MORE DENTAL JOURNALS.

WE have received the first number of *The New England Journal of Dentistry and Allied Sciences*, published monthly by the New England Journal Company, Springfield, Mass., and "Edited by Associated Dentists;" Charles Mayr, A.M., B.S., scientific editor; 32 pages, $2.00 per annum.

The first number of the *Southern Dental Journal*, a monthly published by R. A. Holliday, Atlanta, Ga., is also before us. It is edited by B. H. Catching, D.D.S., and contains 44 pages. The price is $2.00 per annum.

There are now seventeen periodicals, good, bad, and indifferent, devoted to dentistry, published in this country—eleven monthlies and six quarterlies. It would seem that room is thus provided for all grades of writers, and literature for all classes of readers.

BIBLIOGRAPHICAL.

A TREATISE ON HUMAN PHYSIOLOGY. By JOHN C. DALTON, M.D. Seventh Edition. Philadelphia: Henry C. Lea's Son & Co., 1882. Price, cloth, $5.00; sheep, $6.00; half Russia, $6.50.

This latest edition of what is one of the most popular and best known text-books on physiology in any language has all the merits of its predecessors with some material improvements. To speak of the general plan of the book, of the clear, concise, and entertaining character of its contents, or of its unquestioned reliability as a guide in the matters of which it treats, would at the present day be more than superfluous. It is gratifying, however, to find that it has now been brought up to date in every respect, and that the recent great advances in the various departments of physiological science are embodied in its pages. In glancing over it we observe, for example, that the chemistry of the ferments, the precise constitution and destination of the albuminoids, the localization of function in the cerebro-spinal axis, the origin, distribution, and action of the vaso-motor and sympathetic systems, the histology and development of the primitive embryonic structures, and many other subjects, the relations of which to practical medicine are most intimate and important, have received careful attention, and have been much more fully discussed than heretofore. The progressive evolution of medical *science* in contradistinction to the *art* of medicine constantly brings into closer connection the conditions of health and disease, and renders more and more necessary to the practitioner who would do justice to himself and his patients a broad foundation of physiological knowledge. The explanation or proper understanding of symptoms is impossible without a thorough acquaintance with the laws of health. Then, too, when the physician meets with such cases in practice he will find that his diagnosis, prognosis, and treatment all depend upon this same knowledge, without which he is simply an empiric of the lowest degree. Surgical or medical text-books will not be found to supply this deficiency, or, in most cases, to furnish a satisfactory explanation of the phenomena which they record; and to the specialist in dentistry, if he would rise above the level of mere mechanism, no knowledge is more important than that of the systemic relations of the tissues with which he is more particularly concerned.

These statements are truisms; no one denies the importance of this branch of learning; but it is too commonly undervalued and lost sight of by the student and practitioner, and we offer no apology for urging upon our readers the purchase and study of this or of some kindred work.

A POCKET-BOOK OF PHYSICAL DIAGNOSIS, for the Student and Physician. By DR. EDWARD T. BRUEN. With eight wood engravings; 256 pages. Philadelphia: Presley Blakiston, 1881. Price, $2.00.

The author of this volume has been engaged for several years in teaching diagnosis to private classes of post-graduates and others, and the substance of his instructions is here given. The book is intended as a guide to the student and practitioner. It is divided into two parts. As introduction, eleven pages are devoted to the normal positions and relations of the thoracic and abdominal organs. Fourteen chapters are given to a consideration of the lungs and pleura, and twelve to diseases of the heart and pericardium. The pathological changes indicated by the physical signs are concisely and intelligently described, and the modifications caused by structural alterations lucidly explained.

The subjects are discussed with such clearness and force that the reader is enabled to master the philosophy of the teaching and to appreciate the significance of physical signs in diagnosis. We cordially recommend the volume as a compact and yet comprehensive manual to all who are ambitious to acquire skill in physical diagnosis.

THE MOTHER'S GUIDE IN THE MANAGEMENT AND FEEDING OF INFANTS. By JOHN M. KEATING, M.D. Philadelphia: Henry C. Lea's Son & Co., 1881. Price, $1.00.

This neat little volume is intended as a guide to mothers who desire to be judges of what is good or bad for their own children—an ambition which it would seem every mother should possess. The instruction begins with the birth of the child, and includes all the requirements of a new-born babe,—its washing, dressing, nursing or feeding, bathing, changing, etc.

The book is one of the best of its class which we have seen, but it assumes a degree of intelligence on the part of the mother which, in some instances, suggests the fear that it may encourage her to trench on the province of the physician. A wise discretion, however, and good judgment are displayed in the general avoidance of such risk. The author's description of the more common ailments of children, and the directions for their treatment, would prove safe and of great value to a mother so situated as not to be able to command the services of a reliable doctor; and a careful perusal of the book by mothers could not fail to give instruction, which if followed, would result in a higher standard of health in their children. The only serious fault we find with the book is the absence of an index.

LANDMARKS, MEDICAL AND SURGICAL. By LUTHER HOLDEN, Royal College of Surgeons; assisted by JAMES SHUTER, M. A. Camb., F. R. C. S.; with additions by William W. Keen, M.D. Philadelphia: Henry C. Lea's Son & Co., 1881. Price, $1.00.

This volume, which in six years has reached a third edition, presents in compact form the medical and surgical landmarks on the surface of the body. It may be called a topographical geography of the human form, indicating by external lines, eminences, depressions, etc., the position of internal organs; thus enabling the student and practitioner to appreciate the normal location and relation of the various structures of the body. Dr. Keen has added practical matter throughout the book which enhances its value.

A MANUAL OF ORGANIC MATERIA MEDICA. Being a Guide to Materia Medica of the Vegetable and Animal Kingdoms. By JOHN M. MAISCH, Phar. D. With many illustrations on wood. Philadelphia: Henry C. Lea's Son & Co., 1882. Price, $2.75.

This volume is designed especially for the instruction of druggists and students of pharmacy. The classification of the material is based upon likeness in physical and structural properties, and the peculiarities of each are thus made more prominent by comparison, enabling the student or pharmacist to recognize drugs, determine their quality, detect their adulteration, and distinguish the characteristic differences of those closely allied in their general features.

QUIZ QUESTIONS: Course in Dental Pathology and Therapeutics, Philadelphia Dental College, Professor J. FOSTER FLAGG, D.D.S. Answered by Wm. C. Foulks, D.D.S. Philadelphia: George A. Fowler & Co., 1882. Price, $2.00.

This little volume of ninety-eight pages contains about five hundred questions on dental pathology and therapeutics, and concise answers thereto. The questions are chiefly those arranged by Professor Flagg for the guidance of students, and the answers are compiled from notes of his lectures. The objection to all such so-called manuals is in the disposition which they encourage to "coach" for examination, and thus lessen the necessity for more thorough scholarship in order to "pass." Of its kind, however, the book is a good sample.

THE THROAT AND THE VOICE. By J. SOLIS COHEN, M.D. Philadelphia: P. Blakiston, Son & Co., 1882. Price, 30 cents.

OUR HOMES. By HENRY HARTSHORNE, A.M., M.D. Philadelphia: P. Blakiston, Son & Co., 1882. Price, 30 cents.

These are two of the "American Health Primer" series now being reprinted in cheaper form from the plates of the original edition. They were noticed in our journal at the time of their first appearance, in 1879.

OBITUARY.

M. S. DEAN, D.D.S.

Died, at Chicago, Ill., January 28, 1882, Mason Stillman Dean, D.D.S., in the fifty-seventh year of his age.

The death of Dr. Dean was sudden and unexpected. He had spent the evening preceding his death at the house of a friend, giving no indication of illness, and must have died peacefully during the night. He was found in bed, lying upon his back, with hands laid loosely across his breast, and the bed-covering undisturbed, indicating that he had died without a struggle and probably without awaking from his sleep.

Funeral services were held at the residence of Dr. J. N. Crouse, the Chicago Dental Society attending in a body. The remains were taken to Mystic, Conn., for burial.

Dr. Dean was born in Pittsfield, Vermont. He obtained the foundation of his education in the higher academies of his native State, and early commenced teaching. In 1843 he studied medicine at Ogdensburgh, N. Y., and subsequently dentistry with Dr. D. C. Ambler; commenced dental practice in Dundas, Canada, removing from there to Milan, Ohio, where he remained in practice till 1852, when he went to Marshall, Mich., continuing there until 1864, when he removed to Chicago, where he remained until his death.

Dr. Dean took a prominent part in all that concerned the advancement of his profession, and received unsought the highest offices in city, State, and national dental associations. He was one of the organizers of the Illinois State Dental Society, of which he was made president in 1869, and was twice elected to the same office in the Chicago Dental Society. He served for five years as recording secretary and chairman of the Publication Committee of the American Dental Association, and was in 1875 elected president of that body. His literary attainments were far above the average. His contributions to the American Dental Association, to the Illinois State Dental Society, and especially his translation of Legros and Magitot's work on "The Dental Follicle," embodying his own original investigations, are valuable additions to the permanent literature of the profession.

As a man he was possessed of a keen sense of justice, and was strictly upright in all his dealings. Dignified and self-respecting; kind and considerate to others; intelligent, accomplished, and genial in his intercourse, he won the affection and held the confidence of all who knew him. Dying he has left probably not one to cherish an unkind remembrance of him.

A meeting of the Chicago Dental Society, more largely attended than any previous one in its history, passed resolutions expressive of their appreciation of his professional and social worth and of the affectionate regard which they had entertained for him, and ordered the following tribute to be placed on record:

Death has entered our ranks with so sudden and terrible a shock that we are stricken almost dumb.

He has laid his hand upon the one, the best beloved, the most honored, the most respected, and our hearts are bowed down with a grief we cannot find words to express.

In the life of our friend we may read the history of a lofty ambition, never prostituted to selfish ends, but pursued for the advancement of his chosen profession and the benefit of his fellow-men; and while we cannot understand the decree that took him from us in the height of his usefulness, we are grateful for the tenderness which tempered the blow, and permitted his life to close so peacefully, without one sigh of pain.

He is gone! The ripe scholar, the true gentleman, the wise counselor, the generous friend! We can never again feel the warm grasp of his friendly hand; we can no more listen to his words of counsel, nor will his genial smile again brighten our gatherings.

We MUST mourn, and while we strive to express our sorrow, any words we may utter can be but a feeble expression of what we feel; yet in our hearts he will have a monument which shall endure as long as memory shall last, and the example of his pure life and lofty devotion to all that was most worthy will ever be an incentive to us to follow the path in which he so bravely led the way.

PERISCOPE.

THE WISDOM-TEETH AND DEAFNESS.—That various forms of otitis are a frequent accompaniment of primary and secondary dentition is a fact not to be disputed, but that a most insidious and intractable form of chronic otitis with its accompanying deafness often owes its origin to a tardy or otherwise abnormal eruption of the wisdom-teeth is a matter not so easily recognizable, and about which our text-books are unaccountably silent.

My attention has been directed to this matter for some years, and to judge by the number of cases to be met with, this mode of causation of chronic dysecoia is by no means uncommon.

It requires obviously a little patience in investigating the history of our cases before we can ascertain for certain whether this mode of origin is distinctly traceable or not; that the wisdom-teeth in process of eruption are a frequent concomitant of severe and intractable deafness is obvious enough; that they constitute the sole exciting cause of the deafness is another question, and one more difficult to demonstrate.

That they are very often the unsuspected cause of deafness I have been led to infer—firstly, from the intimate sympathy existing between the teeth and the ears, and the consequent very obvious prejudicial effect of infantile dentition upon these organs; and, secondly,

from observing the number of cases of deafness met with that date their initiation from that period of life at which these teeth appear.

Such cases as the following are not at all uncommon, and the dental origin would certainly be unsuspected without special inquiry:

CASE I.—The Rev. C. H. B., aged 50, consulted me, June, 1881, for deafness, which has existed, he says, for some twenty years. He cannot think why it should have come on, but on careful inquiry I find that the wisdom-teeth were erupted with great difficulty; that the left lower wisdom-tooth "grew into the cheek," was decayed, and had to be extracted; that about twelve years ago the same occurrence took place with either the right or left upper wisdom-tooth—he forgets which—and that it, too, had to be extracted, after having had years of trouble with it.

The inference, then, is natural that the eruption of the wisdom-teeth being difficult, there was occasioned insufficient innervation in the structures of the middle ear. Then take the next case:

CASE II.—Miss F. S., a young lady of 25 years, consulted me, December, 1880, for deafness of the left ear. The hearing of both ears, however, is imperfect ($\frac{7}{35}$ right, $\frac{3}{35}$ left); the left membrane is of a dull, opaque hue, the malleus handle being prominent and very white; the right is in appearance normal. Inflation improves the hearing of the right; has no effect upon the left ear. F. S. states herself to have been partially deaf for six years, but never sought treatment for it till a year and a half ago, when, after a right wisdom-tooth was extracted, her left ear began to get noticeably dull. She then consulted a German aurist who put her case down as one of ordinary catarrhal otitis. The left upper and the left lower wisdom-teeth have not made an appearance.

The inference then is plain that the ears and teeth are being contemporaneously influenced. Also, a very important practical deduction for the aurist from this case is to me perfectly obvious, that *we gain no relief to the ear by the removal of the offending tooth.* This may seem to tell against my proposition that the teeth are the cause of the deafness, but in reality my position is not so much this as that simply in the process of dental evolution a prejudicial effect is often wrought upon the ears, the deafness being, in fact, the physiological concomitant of the tardy tooth-development—the deafness, therefore, not being always in the position of such obvious causal relationship with the teeth as to justify on this ground alone the removal of these very necessary portions of the economy.

Therefore, in all such cases, I would say, let us deal with the teeth upon their own merits, irrespective of all aural complication. If, for example, they are painful and carious, let us apply to them the rules that guide the surgeon when dealing with obvious sources of irritation, at the same time being careful to guard ourselves against holding out a hope of, *necessarily*, a sequential improvement in the hearing.

[Other cases are given, and the author proceeds:]

I might quote many other cases that give support to my position as to the primary importance of recognizing the wisdom-teeth as concerned in the production of ear symptoms. The form of deafness that dates its inception to the period at which the wisdom-teeth erupt is in no way distinguishable from the ordinary chronic deafness

described by Toynbee under the head of "Rigidity of the Mucous Membrane of the Tympanum," and by Roosa as "Proliferous Deafness."

As a variety of this affection, it is perhaps less often attended with tinnitus than the majority of these cases, but even this is a feature not sufficiently noticeable to justify independent classification.

As to treatment, I have not yet found any one drug upon which reliance could be placed, though in one case I certainly succeeded in effecting a cure by relying for the selection of the remedy upon the symptoms of the case. As to Pollitzer's inflation, it does no good whatever; neither does catheterization of the tubes succeed; and as for post-aural blisters and intra-tympanic injections, they are a delusion and a snare.

Among the lessons we learn from this investigation is the importance of attending well to the condition of the teeth in all cases of obscure chronic deafness, for surely if wisdom-teeth in process of eruption can exercise such a baneful effect upon the ear as they are now proved to do, a like injurious effect is presumable on behalf of carious teeth, painful stumps, or ill-fitting artificial plates. I would, for this reason, insist upon the absolute necessity for the aurist to provide himself with a good dentist's mirror, and to examine the state of the teeth and gums in every instance of aural affection, be its nature what it may.—*Dr. Robert T. Cooper, in Dublin Journal of Medical Science.*

NEURALGIA.—GENTLEMEN:—To treat neuralgia scientifically is to recognize that the meaning of it is pain arising out of a cause; is to make discovery of the cause and to remove it.

CASE 1.—Mr. E., aged sixty. The case before the class is one of peculiar interest. Six months back I diagnosed a lesion existing in the nerve-canal of the lower jaw. The canal was opened and a spicula of bone discovered growing directly across it; the nerve was found jagged, tumid, and broken down in places. The general health of the patient was miserable, as the result of the pain suffered and the opiates taken to relieve the pain. The diseased nerve was thoroughly removed.

The pain is back. The patient insists that he feels it at the original seat. You think it cannot be so situated; that the perception is akin with that which feels pain in a toe that weeks before was buried with an amputated leg. Of this last I am not at all sure. I am in doubt as to whether there are not cases in which the mylohyoid nerve perforates the bone.

In the case of the patient before us, one thing is incontrovertible; there is pain; pain so severe that it is not to be endured. There is another fact; the lesion is associated strictly with the third division of the trifacial nerve. Considering the exhausted state of the patient, I shall this morning perform a radical operation. I propose to make a section of the nerve where it appears at the oval foramen. I shall also exsect the jaw. I combine these performances after full consideration. If, from what to-day is done for the case, relief does not follow, it will never be brought about. I have studied the case pathologically and psychologically; I commit myself to the prognosis given.

Operation.—The operation done combined exsection, both of jaw and nerve, and was performed as follows: The patient being etherized, an incision divided the lower lip in its exact median line. Ligatures were placed about the two coronary arteries. Next, a second incision, beginning with the termination of the first, was carried along the shade line of the under surface of the jaw, extending backward and upward, until the zygoma was reached; the facial artery was here tied. A succeeding step dissected the soft parts from the face of the bone, the masseter muscle being lifted from the ramus. Free exposure thus secured, the operator proceeded to remove the bone, after a manner devised by him of leaving a rim of continuity and preserving the inner layer of periosteal structure, the latter to be used in covering the seat of section.

In the bone-operation the surgical engine is used, the cutting instrument being a circular saw revolved at the rate of at least ten thousand revolutions to the minute. First, an anterior cut was made, commencing from the socket of an extracted lateral incisor tooth, and extending inward to the periosteum, and downward until but a quarter of an inch remained undivided. Second, a similar cut was made across the lower face of the ramus. Third, the widely separated cuts were united by means of another carried from behind forward along the base of the bone. Fourth, the section was thrown inward, and the periosteum worked off by means of a chisel-shaped knife. This completed the jaw section.

Commencing the second operation by grasping the exposed inferior maxillary nerve with the teeth of a bull-dog forceps, the saw of the engine was replaced by an oblong bur, three-quarters of an inch in length by half an inch in diameter. With this bur in rapid rotation, the bed of the nerve was quickly scooped out until the exit from the posterior dental foramen was exposed. Pursuing his new method, Prof. Garretson enlarged the foramen until freely exposing the pterygoid muscle. The nerve, put on the stretch, was lifted from its bed and protected from all its immediate relations in the zygomatic fossa. The conclusion of this part of the operation consisted in passing through the enlarged foramen the blades of a pair of delicate scissors, and in nipping the nerve off just below the oval foramen.

The wound being permitted to remain exposed until a reasonable glaze was secured, the closing commenced by stitching the periosteum over the face of the cut jaw, and, next, in accurately adjusting the separated lip and cheek.

So rapid was the process of cure, that the patient left Philadelphia for his home in a distant city, in just thirteen days.

No neuralgia has since troubled him.—*Clinic of Prof. Garretson, Reports Hospital of Oral Surgery, Medical and Surgical Reporter.*

Fistula beneath the Chin of Four Years' Standing.—The lady before you has, you see, a little sore beneath the chin, a trifle to the right of the median line; this sore has persisted, in spite of much treatment, for a period of four years.

A sore, to defy direct treatment, must have something as a support back of it. This sore, I am sure, has something back of it. I have met, in my experience, with many looking like it, but never

one where a directly immediate medication applied to its face could, by any possibility, amount to anything in the way of cure. A moment and you will understand this.

The sore before us is the outlet of a fistulous track. It is not at all a thing having meaning in itself; it exists in some other thing, for which we at once proceed to make search.

With this silver probe I enter the fistula; it leads, as I presumed we would find, directly to the bone. Here we may pass to the mouth. The patient wears artificial teeth, full sets above and below. Removing the lower set there is nothing of unhealthy character to be seen.

I commit myself, gentlemen, by saying that I have never met with a fistulous sore like the one before us, where a tooth, or the root of a tooth, was not at the bottom of it. If here there is found no dental origin, I have to note my first exception.

Confident in my experience, I make a cut along the gum. I dissect the gum from the bone. Convict me, if you please, for a mistake. I confess I never exposed a healthier looking bone. I dismiss the patient that the wound may heal; you shall see the lady later.

* * * This is the patient who, as you will recognize, seemed to convict us of a mistake a few days back. To-day we are to clear up the matter. Ten years back, as I have learned, an operation was performed on this jaw by an eminent surgeon of a distant city for cure of the condition as we here find it. The bone was exposed and scraped. The result was nil.

The patient being etherized, I make a cut along the shade-line of the neck, directly to the jaw. Let us dissect away, for a little distance from either side of the fistula, the overlying tissue. * * Here is health again, nothing but health. The facial side of this jaw-bone is perfect. I will, with extreme delicacy, expose a little of the neck aspect. Here is a small hole. I stick a steel pin into it to make the location. This hole leads to the meaning of the external sore. What I shall do, is the only thing to be done. I shall follow the lead of the hole and see where it goes. Please note how I shall follow the lead. I pick up the penholder-looking instrument, which you all know as the hand-piece of our surgical engine. My assistant, as you see, has armed it with a bur. Now we will put it in motion. It appears as still as though it were lying untouched upon the table, yet at this moment the bur is making ten thousand revolutions to the minute. It is an instrument of magical delicacy. See what it can do, and how it does what it can do.

Operation.—With a few touches, as one would manage a pen, the opening was enlarged, the bone falling into a mass of carious detritus composed of the cancellated structure of the bone. The inside of the jaw, for quite an inch to either side of the hole, was completely broken down. Among the patches removed by the bur, the apex of a tooth-root was found.—*Clinic of Professor Garretson, Reports Hospital of Oral Surgery, Medical and Surgical Reporter.*

Six Cases of Syphilitic Necrosis of the Jaw.—*Case* 1. A young man from Yarkand, who was literally dying from the pus which he had daily to swallow from necrosis of the whole bone of

the lower jaw, from one condyle to the other. Nothing but removal of the entire bone seemed likely to do any good. This was done in July, 1877, by an external incision. The operation was a formidable one, in which the able assistance of Drs. Williams and Ross of the Indian Medical Service was both acceptable and extremely serviceable.

The patient was placed in an arm-chair, and chloroform was given. An incision was then made from a point opposite the condyle on the left side to the angle, along the bone to the symphysis and from thence to the corresponding spot on the right side. There had been so much inflammatory action that the facial arteries were obliterated and required no ligature. The flaps were turned up, and it was then found that a good deal of reparative action had been going on. The operation was completed by removing the whole bone, temporal processes and articulations. There was no real difficulty about the operation, and, thanks to the excellent assistants, it was speedily completed. Dr. Williams put in the sutures, using by preference horsehair for the purpose. The patient had to be fed on milk for about a fortnight, but during that time he never suffered much pain, and he did not have a bad symptom. The sutures held firmly, and the outside wound healed by first intention. There was some secretion of pus in the inside of the mouth as the cavity left by the jaw healed, but it was much less in quantity and less offensive than that formed before the operation.

The patient's health improved from a day or two after the operation, and he steadily gained strength till he left the hospital, which was little more than a month after the operation. At that time few people would have suspected that his jaw had been removed, had it not been he adduced the "ocular proof" in the old jaw, which the patient carried away to his native land, wrapped up in a piece of newspaper.

Cases 2 *and* 3. The success of the above case led Mr. Downes to attempt the removal of half of the jaw on two occasions in 1878. One case was that of a middle-aged man, a Hindoo. In this case the discharge of pus was excessive, and was poisoning him. He was first seen with Dr. Currie, the Civil Surgeon, who thought that his health was so much impaired that operation was not advisable. However, it was at length decided to give him the chance of operation, and Dr. Currie kindly assisted in the operation. The other case was of a woman, also middle-aged, and a Hindoo.

It is not necessary to describe the operation very minutely. In both cases the disease, though very extensive, was limited to one side. The operation was the same as that done in Case 1, except that the incision was limited to one side, and the bone was cut through a little to the side of the symphysis with a Hey's saw and bone-forceps. In the case of the man (Case 2) the external wound healed without difficulty; in the case of the woman (Case 3) a fistula formed which gave great trouble, but eventually healed. In both these cases, one or two incisor teeth on the other side became loose, and had to be removed. In the case of the man, a piece of bone remained bare some months afterwards, and probably has loosened and come away without much trouble; but he has not been seen for more than a year.

In both these cases a great deformity resulted. The face was very much drawn to the side from which the bone was removed. Though both these lives were saved by the operation, the result was not quite satisfactory in either case, and contrasted very unfavorably with that of the three cases recorded below, in which about half the jaw was removed from the inside of the mouth.

Cases 4, 5, *and* 6. All these three cases were seen in 1879, and were tolerably young men, and in each case the disease was extensive, though quite confined to one side, commencing about the first bicuspid tooth and extending back nearly to the articulation, though in all three cases the joint was unaffected. In one case the temporal process was diseased, but not in the other two; the bone was loosened in all three cases opposite the first bicuspid tooth, but the disease was still progressing in the other direction. In one case the patient applied to have his last molar tooth extracted. It was only while this was being done that the full extent of the disease was discovered. The state of affairs was explained to the patient, and with his sanction chloroform was given, and the operation completed.

The operation in all three cases was very similar. The patients were placed under chloroform, in the recumbent position, and after removal of the teeth on the diseased side the periosteum was separated from the bone as far back as possible from the line of demarkation near the bicuspid tooth backwards. There was a little hemorrhage. The denuded bone was then seized with lion forceps, and in each case the bone broke at once near the angle. The end of the bone having again been seized with the lion forceps was pulled out as far as possible, and the periosteum was separated a little further. Thus, in all three cases, the whole of the diseased portion of the bone was removed, including the temporal process and articulation. Considerable force had to be used in one case in order to tear asunder the tendon of the temporal muscle. In another case the muscular fibers of the internal pterygoid were ruptured. No injury was done by this seeming violence, and there was no troublesome hemorrhage.

The patients complained of very little pain afterwards—in fact, they were very pleased at getting rid of their diseased jaws, and the loathsome discharge attending it. For a few days there was a good deal of swelling, but there was not a very great discharge of pus, and in less than a fortnight the wound was healed and new bone had commenced to form; the healing process continued satisfactorily, and all three patients left the hospital in about three weeks with very little deformity.—*Reports of Kashmir Hospital, in Lancet.*

Salivary Colic—Expulsion of two Salivary Calculi.—Dr. R. St. Phillippe reports in the *Journal de Médecin de Bordeaux*, August 7, 1881, the case of a man who was believed to have had an abscess of one of the salivary glands. There was great pain in the maxillary, cervical, and temporal regions of the left side, with diffuse swelling under the jaw and on the floor of the buccal cavity. At the same time the masseter muscles were in a condition of contraction, preventing complete opening of the mouth. Digital exploration revealed the existence of a pocket on the left side of the frænum in the course of Wharton's duct. Incision of this tumor was only fol-

lowed by the escape of blood and saliva, but it produced considerable relief. Several hours afterwards the patient drew from his mouth two salivary calculi, about the size of a bean and a pea. All the symptoms then disappeared, and exploration of the duct by means of a probe passed through the wound showed that no other calculus was present.—*L' Union Médicale.*

HINTS AND QUERIES.

"He that questioneth much shall learn much."—Bacon.

Correspondents desiring a reply in this department are requested to make use of *distinctive signatures or initials*, and avoid the practice of signing their communications Reader, Subscriber, etc.

Correspondents who wish notice to be taken of their communications should authenticate them with their names. We cannot insert queries or replies except they are so accompanied. Names not necessarily for publication.

My Method of Mounting Porcelain Crowns.—To prepare the root, cut off the natural crown (where desirable, below the gum, so that when the gum resumes its natural position it will cover the joint between the root and porcelain crown). Drill out the canal to the apex of the root; roughen its inner walls, and undercut it, enlarging the outer portion to correspond with the opening in the crown to be attached. Make the edges in both crown and root thin to prevent lodgment of the filling-material between them, which would show a dark line after mounting. Grind the crown to conform to the root, fitting it closely, edge to edge. If, in fitting, the edge of the crown becomes thickened, grind to its original form. Take care that the tooth is properly antagonized, as any defect in this particular cannot be remedied by grinding until the amalgam has become perfectly hard, and a false occlusion meanwhile would be likely to throw the crown out of position. Having thoroughly cleansed the canal, saturate a little pellet of cotton with creasote and force it up to the apex, closing the foramen. If the canal is small, and straight enough to enable the operator to adjust the pin to fit it closely, and the pin, nicely barbed, be forced to the end of the root, it will give great strength and steadiness to the crown.

The root being in readiness for the crown, the pin should be cut a trifle shorter than the length of the root and crown. If the canal is large, and it is thought desirable, use a three-cornered platinum wire, pointed at both ends and well barbed each way (to and from the line between the crown and root). Bending the pin so that it will impinge against the palatal wall of the crown, if in an incisor, will assist in holding the crown while the amalgam is setting. The crown having been adjusted to its place in the root, the canal dried, and all in readiness, fill with amalgam entirely up to the end of the canal; then take a pointed instrument the size of the pin and force it through the amalgam, to open a way for the pin, which may then be placed in position by grasping it with a pair of pincers, and gradually pressing it into place.

The crown should now be tried on to ascertain whether the pin will permit it to assume its desired position. A thin, flat plugger may be used to condense the amalgam around the pin. The crown should now be filled with amalgam and forced into place. To insure its close adaptation to the root, it may be tapped with a wood mallet. This will force any excess of mercury to the surface. Then, with a harder amalgam, or with one from which the mercury has been *thoroughly*

expressed, fill around the pin on the palatal or grinding surface. The mercury which has been forced to the surface will help to unite this with the amalgam previously inserted. Trim off the excess around the joint, and finish smoothly.

The patient should be cautioned not to use the tooth until the amalgam is thoroughly set.

Fig. 1.

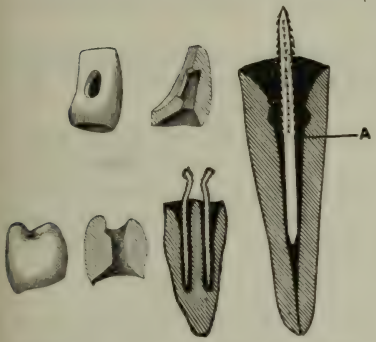


Fig. 2.

Fig. 3.

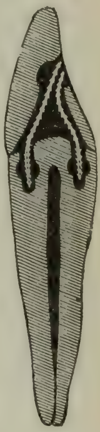


Fig. III. shows a sectional view of an all-porcelain crown, and the method of attaching it to a root in which the pulp is still living. A cavity is made in the buccal and lingual sides of the root as far away from the canal as possible, and very little larger than the three-cornered pin. Make an undercut enlargement near the opening with a barrel-shaped bur. The sides of the undercut next to the crown should be as near a right angle as possible. In such a case the amalgam should be used quite dry, as the pins do not have to be pushed far, and can be well tamped in with narrow, blunt steel points, so as to make sure that the amalgam is solid. The operation may be finished at once, or its completion postponed until the next day in order to ascertain if the pins are secure.—E. H. P. W.

About Gold.—Much has been said and written as to the relative merits of soft and cohesive gold for filling teeth. It is not my purpose to enter into any discussion as to the merits of either form as considered in itself. I do not remember to have seen any mention in any of our professional books or journals of the use of soft and cohesive gold in the manner which I am about to describe. Every one who has noted carefully the work which has come within his observation knows that soft gold, as used by the pioneers of our profession twenty, thirty, fifty years ago, has saved, and still saves teeth, where fillings of cohesive gold do not. Many of these fillings are unsightly and well worn away, yet the teeth are thoroughly protected from a recurrence of decay. It is not necessary for me here to recapitulate the merits of either form of gold; they are well known. We have all experienced the difficulties in packing cohesive gold perfectly against the walls of an approximal cavity, and especially against the buccal walls and undercuts of a posterior approximal bicuspid or molar cavity. To obviate this difficulty somewhat, I conceived the idea of packing against the walls of such cavities soft gold, as it admits of closer adaptation than cohesive gold, and will pack more readily in undercuts. My method of inserting such fillings may be briefly explained as follows: take for example a posterior approximal inferior

bicuspid or molar cavity. The extreme difficulty of obtaining close and moisture-tight adaptation to the buccal walls is apparent. Starting upon the cervical wall (after the cavity is properly prepared of course), I fill perhaps one-third the depth of such cavity with soft gold, packing it carefully against the cervical, buccal, and lingual walls, allowing the gold to overhang the margins sufficiently to admit of proper finishing; next begin the introduction of cohesive foil, using it only to fill in the center, all the while packing *soft* gold against the *walls*. We have, when finished, a filling of cohesive gold, surrounded by a layer of soft gold on all sides in contact with the walls; hence we have perfect adaptation to the cavity walls, together with the hard and wearing qualities so prominent in cohesive foil.

Such a filling combines the best qualities of both forms of gold, almost entirely overcoming the objections that can be urged against either as used alone. Tin foil may be used in the place of soft gold in the same manner.

This is with me yet mainly a theory. I have made many such fillings within the past year, but they have not stood the test of time, so that the resulting percentage of successes cannot yet be determined. But I have no doubt whatever that in difficult cavities, soft and cohesive gold combined in the manner I have described, will produce better results that either alone. I hope it will be tried and reported upon by others.—J. H. Spaulding, *Fargo*, *Dakota*.

Dental Diplomas in the State of New York.—The district dental societies of the State of New York do not recognize a diploma from any dental college as evidence that the holder is qualified for membership, but accept a license granted by a board of censors or examiners. This fact will probably be a surprise to many, for it is difficult to understand that such an arrangement exists except on the supposition that it is not generally known.

It would be well for recent graduates to consider this matter and the practical bearings of such a rule before consenting to an examination by a board of censors as a pre-requisite for admission to any society. The regulation is a reflection not only upon the applicant, but upon the college whose diploma he bears; and while the dental colleges of the United States are endeavoring to secure a recognition of the value of their diplomas in foreign countries, these district societies are furnishing an argument to the opposition by non-recognition at home.—Charles T. Howard, D.D.S., *Rochester*, *N. Y.*

In furtherance of the movement looking to the appointment of dental surgeons in the army and navy, let me suggest that the best presentation of the importance and necessity of such appointments, together with suggestions of what would be proper regulations for the government of such appointees, be prepared and furnished to the dentists of the entire country, with a request that each one add to it his own personal appeal, and present both to his Representative in Congress. The expense would not be great, and might be provided for in one of various ways.—W. E. Driscoll.

Those who use that invaluable preparation, resin and ether, and are troubled by having the stopper become fixed in the bottle by the drying of the solution, can overcome the difficulty by putting around it a little vaseline. This also makes a tight joint, so that no evaporation of the liquid takes place. Renew the vaseline as often as necessary.—D.M.C.

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ORIGINAL COMMUNICATIONS.

DENTAL PATHOLOGY AND THERAPEUTICS.

BY J. FOSTER FLAGG, D.D.S.

PROFESSOR OF DENTAL PATHOLOGY AND THERAPEUTICS IN PHILADELPHIA DENTAL COLLEGE.

(Continued from page 20, January, 1881.)

AFTER the tooth is properly replanted, the next consideration is its maintenance in position in such manner as to preclude motion and irritation from occlusion, and thus secure the greatest probability of prompt healing.

For this purpose I have usually found the natural placing of the antagonizing teeth, and the retention of these firmly and accurately quiet for a day or two, productive of the best results, and I regard the Garretson modification of the Barton bandage as the best means for accomplishing this.

GARRETSON'S BANDAGE—"Take a strip of roller material, one and one-half or two inches wide, one and one-half yards in length. Standing behind the patient, rest the chin on the center of this strip, carry the ends up, cross on the forehead, carry around the sides of the cranium, cross again at the occiput; carry now forward and tie, *or otherwise fix*, in front of the chin."

The great advantage of this form of bandage is the facility with which any desired re-adjustment, such as tightening, loosening, etc., can be done.

For incisors and cuspids the two methods of ligation and gutta-

percha splint have been proposed, but my experience points decidedly to the employment of the splint. I have found ligating exceedingly difficult and unreliable, and this even though I am quite familiar with knots and with string applications; I have therefore concluded that such securing would be largely impossible for the inexperienced, while the making of a gutta-percha splint is not at all a serious matter. The very practice which enables any tolerably competent dentist to secure an articulating "bite" in wax subserves to insure the obtaining of a good articulating splint of gutta-percha.

After the replanted tooth is properly in position, a sufficiently large ball of red base-plate gutta-percha is warmed carefully over the flame of a spirit lamp and is then molded arch-shaped. It is now accurately pressed into position over the replanted tooth and several of the adjoining teeth on both sides of it.

The occluding teeth are now bitten into the mass, and *it is upon the correctness of occlusion with which this is done that the excellence of the result depends.*

As this is so markedly the case, it is better that this process should be repeated with soft wax several times prior to the replanting of the tooth and the final adaptation of the splint.

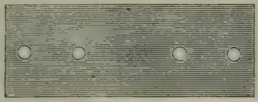
As an increased guarantee to correctness of bite, I would suggest the *forcible* pressing backward of the chin during the closing of the jaws; it will be almost invariably noticed that a sudden slipping snap of the lower jaw will occur as it passes into its proper position just before the teeth impinge upon the wax or gutta-percha; the chin should then be still strongly pushed upon, and thus securely *held back* as the teeth are forced closely together.

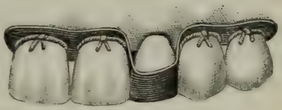
The splint is held in place by the bandaging already referred to, and should be thus maintained for a day or two, or three, according to requirements.

It is, of course, necessary that fluid food only shall be given during this period of recuperation, but the highest style of nourishment can easily be attained by *frequent* administration of *moderate quantities* of milk, broths, refreshing sugared waters, such as blackberry, raspberry, etc., and the occasional use of such strengthening medicaments as solutions of the phosphates, dissolved extract of coca (Peruvian leaves), or tincture of bark or bitter wines, if such are agreeable to the patients.

I desire also to call attention to the ingenious application of rubber dam for the maintenance of replanted teeth in position, which has been suggested by Dr. Herbst. The illustration presents so graphically the idea, that any further description seems unnecessary; but it may be remarked that with this apparatus a much greater variety of desirable food is rendered possible.

My experience has been that it is the rare exception, when with good treatment the operation of replantation is not followed by tolerably prompt healing and by quite satisfactory and reasonably permanent success, and yet, as I have intimated, I have had cases which





have resulted most unsatisfactorily, and, having eventuated in prompt recurrence of trouble, this was only relieved by the almost equally prompt removal of the teeth. I have tried a second replantation, but it only resulted in a more prompt third and final extraction.

I have spoken of the filling of the teeth which it is proposed to replant, prior to the replantation, and I have said that these should be *temporarily* filled, but I desire, in conclusion upon this point, to direct attention to the fact that the *cavity of decay* was thus referred to only as it had been utilized in connection with the possible future need for venting the tooth. If there is no such connection between the original cavity of decay and future contingencies, such cavity should be filled in the best manner and with the greatest regard to beauty and permanence; and again, it is by no means the case that the filling designed as "temporary" in the passage and cavity of vent should necessarily be removed. On the contrary, like very many fillings of gutta-percha which have been introduced as "temporary" into cavities of decay of teeth while in the mouth, and which have done ten or fifteen years of faithful service, so may these *temporary* fillings remain until circumstances demand their removal in some future effort at prolonging the usefulness of the treated teeth.

We have now reached that high and uncontrollable form of periodontitis which I have mentioned as the *fifth* grade. In this grade we find a condition of inflammatory action which, precluding any attempt of more than very short duration at inducing suppuration, and defying everything in the way of antiphlogistic treatment by absolutely refusing to be comforted, rapidly passes through all the increasingly violent phases of such acute inflammation as literally *compels* an early *extraction of the tooth.* Instances of this kind are found in patients of pure nervo-sanguine temperament; these are they who, with their full supply of rich arterial blood, and with their keen sense of perception to injury, present that vigorous ratio of increase of disease, and that concomitant surging of suffering which *demands* relief with all the imperative dictation of their

impetuous nature. Such cases are also found in patients of pure bilio-nervous temperament, particularly when such are not in good condition physically, or are laboring under mental or emotional depression. In these we have the *basal* attributes of nervous quickness; nervous deviations from normality; nervous attempts at recuperation; nervous sensibility to pain; nervous exaggeration and nervous fear; while the *controlling* attributes are bilious strength, bilious positivity, and bilious depression, both physical and mental. From this peculiarly unfortunate combination it results, that inflammatory action, particularly when so located as to be surrounded by the anatomical characteristic of unyielding walls, is marked by strong quickness of pulsation, rapid and positive functional deviations, depressed attempts at recuperation, frantic demands for immediate relief, and absolute refusal of all attempts at endurance.

Finally, cases of this kind are occasionally found in patients of nervo-lymphatic temperament, and, as in pulp complications, the attributes of this most undesirable combination produce results *startlingly* disagreeable in all their phases, so in periodontal inflammation of this type we have a condition in which every ordinarily reliable means for relief suddenly becomes valueless, and even "forlorn hopes" prove utterly hopeless.

In all such cases, as has been stated, the removal of the teeth or roots causing these violent manifestations meets the indications. I have intimated that this rapidly becomes *compulsory*, but it is in deviations from normality like these that combined knowledge and experience make their most decidedly impressive efforts for the benefit of suffering patients.

The situation is promptly realized; extraction is promptly advised and performed; the *most active* antiphlogistic medication—both local and constitutional—is promptly resorted to, and the *persistence* with which this, together with all the varied hygienic concomitants of attention to *position*, *rest*, and *diet*, is maintained, amply proves the comprehensive ability of the dentist, and usually amply rewards both patient and practitioner.

The opposite to this is sometimes most unsatisfactorily illustrated in the tardy apprehension of the magnitude of the lesion, the equally tardy, reluctant extraction, the slowly developed conviction that even the removal of the tooth is insufficient to afford relief, the possibly rapid induction of periodontitis in connection with adjoining teeth, and the now excessively annoying reappearance of all the previous symptoms, with the serious complication of the involving of *two* teeth and all intervening structure.

In *just such cases* as I am depicting, the opportunity is again presented for the *prompt* removal of the teeth and the *vigorous* prosecu-

tion of energetic and *persistent* treatment. It is a serious responsibility to assume ; it requires no ordinary thoroughness of conviction, no trifling degree of professional firmness to effectively maintain a dominant position, but it is only with these attributes fully and solidly developed that one may hope to be a *real comfort* to such sufferers, and a *real credit* to the practice of dentistry.

(To be continued.)

ASSIMILATION OF INORGANIC PARTICLES—TOPICAL ACTION OF MINERAL WATERS.

BY JAMES TRUMAN, D.D.S.

(Read before the Odontological Society of Pennsylvania.)

When the possible pathological relations that may exist between the food we eat, the water we drink, and the air we breathe, are taken into consideration, the importance of these, in a hygienic sense, has not been over-estimated. That they have claimed and are continually claiming more and more the attention of intelligent medical men is creditable to that growing feeling that prevention is better than cure in disease, and that the study of the laws governing all the relations of life, with its surroundings, is of more importance than the discovery of remedies to counteract injurious effects.

It requires but a cursory glance at the history of the world, written in its geological records, to reach the conclusion that the elements of life have undergone and are constantly undergoing change, and in proportion as this is effected, just to that degree will vegetable and animal life present variations. That this must be toward refinement is evident. While it develops new forms it makes new conditions, and these, in their turn, act beneficially or otherwise in proportion to their character. The records of vegetable life left us from the carboniferous era exhibit elements of grossness that must have pervaded all surrounding life. Animal creations superinduced and developed from the coarse vegetable growths assumed characters consistent with the elements of nutrition so remarkably distributed at this period. Judging from what we know of earlier epochs we are justified in the conclusion, that as the cooling process of the world's surface was perfected, and the surface roughly broken by the action of floods and the grinding processes of the glacial period, the detritus left was necessarily combined with elements that bear no proportion to those existing at the present era. While the primary formations give us no evidence of this condition of things, the later period, the carboniferous, solves the problem; and reasoning from the data furnished by the coal-formations, we

can read the past clearly, and with a certain prescience can anticipate the future. Whatever may be thought of the theory of evolution, this much seems to me demonstrated, that no vegetable, no animal, no world was ever created perfect, as we understand it, nor can it be said that perfection exists in all these relations at the present period. Change has gone on year by year, century by century, developing with and in conformity to the variations of the elements combined with the inorganic substances. These, in their turn, by the known laws of assimilation through vegetable to animal tissue have advanced all life to the present hour. As there can be no alteration in the laws of progressive development, the future opens up a wide field for the theorist, in which an era is plainly visible when the earth and all growths will have become so thoroughly refined that our present condition will seem grossness compared with it. That the fabled millenium has some foundation in fact would appear evident, so far as physical development is concerned; and if there is a physical there must be a corresponding mental growth which in eons of time will lead humanity nearer the great central source of all life, the intangible but infinite power of the universe.

While the future of this world is an enticing theme to theorists and dreamers; while the poet may have visions of Arcadian bliss, and the theologian anticipate the period when this sin-laden world will return to the paradisial state of the original father and mother of the race, we are more directly interested in observing the effect of these varied conditions in the production of organs and the building of systems.

It requires but a cursory glance at the flora and fauna of the prehistoric period to be convinced that assimilation proceeded with a result proportionate to the conditions then existing; or, in other words, animal life was coarse because vegetable life was coarse; and vegetable life was coarse because certain elements were contained in greater proportion in the earth and atmosphere. When we examine existing conditions of things on the earth's surface, this idea of the past is strictly borne out. The interior of Africa is covered with a population that appears to vary just in proportion to the cultivation of the soil. In some sections the grossness of human life bears a strict relation to the grossness of the flora; in others the refinement is the natural result of previous conditions. The world's progress is based principally on its food. Egypt advanced over all other portions of Africa because of the fertility of the soil, and, this being taken advantage of, the improved cultivation refined the vegetable forms; they in an equal ratio developed the animal, the animal the spiritual life of this people, until it stood at the head of all ancient civilization.

When we examine another portion of the earth's surface, Australia, we find the aboriginal condition very peculiar. The flora and fauna are measurably unlike those of any other country, and link it in a marked degree to a much earlier period of the world's history. Animals of the marsupialian type exist there in a proportion that has no counterpart in any other land. Indeed, this is the habitat of the only link that connects the animal with the bird—the ornithorhynchus, the duck-billed marsupial; the whole type is indicative of an earlier era. The natural result, and one to be looked for, is a low order of men, the lowest, perhaps, existing on the surface of the globe. I might prolong this analysis through all the various races of men—the low intellectual grade of the Esquimaux fed on blubber; the savage and merciless disposition of the North American Indian fed on an almost purely flesh diet; the evidences of retrogression in the aborigines of Central America, advancing by the cultivation of a productive soil to a high degree of civilization, and returning to the original type of barbarism as the flora was neglected.

The idea I wish to impress is that assimilation and nutrition are clearly progressive and cannot be forced into unnatural channels. The laws of growth have yet to be written. The differences between the protoplasmic elements that originate a tooth and those which originate bone may not be capable of analyzation by the microscope, yet we know there is a force that directs to formation more unerringly than the compass to the magnetic pole; and while Tyndall may quibble over the fact that science stops at this point, the intelligent observer knows that life-formations are governed by a power that cannot be weighed, analyzed, or formulated by science, and yet they are demonstrated by their existence. The process of assimilation partakes somewhat of the same character. We cannot define the why and the wherefore of certain effects, but we know they exist and can draw satisfactory deductions from that knowledge. If the elements that existed in the atmosphere, in the soil, in the flora, produced a fauna of extreme coarseness in an early period of the world's history, and if at all periods this proportion to condition has existed, we infer the law: *That the inorganic elements necessary for the nutrition of higher forms must first be elaborated in the lower.*

If this law be formulated on a basis of correct inductive reasoning, what does it imply and how does it interest us as special workers on tooth-structure? It necessitates a more thorough study of the elements composing every portion of our own organizations. It plainly tells us that we must throw around every individual the best food, the purest air, the most vigorous life attainable, if we would refine and elevate our race. It proves that there can be no assimilation, and consequently no nutrition of inorganic particles

presented to the human organism for the purpose of adding strength to certain organs, as the teeth in our specialty. It demonstrates the incorrectness of the idea that lime in solution is the proper way to feed structure, and finally it clearly points to the only true route, that of nutrition through inferior organisms.

The proportion of the inorganic substances we all know varies in dentures, and their absence in certain structures has been and still remains the cause of much anxiety and difficult manipulation in our profession. I do not propose to discuss the remedy, if such exists, in this essay, as that has already been done by others, but as I remarked in a paper previously read before this association, the improvement must come through changes in soil, climate, and food.

If the process we call nutrition could be carried on by assimilation of inorganic elements, then the question of food would be comparatively a simple one, and instead of the growth of cereals and the driving of animals to slaughter, we would have the chemist busy in his laboratory, and the production of artificial food would become one of the varied industries of the world.

When the lower orders are examined we do not find an assimilation of inorganic particles, or, if such does exist, it is out of all proportion to the amount taken into the stomach. The evidence, if any existed, would be found in far denser dental organs, but this I have failed to observe.

The lower order that lives on a mixed food—vegetable growths and crustacea—as, for instance, the sparoids, ought to illustrate this in a marked degree, but with the exception of increased density of the pavement teeth there is no marked variation from the normal standard, and even this I think can be demonstrated to be the result of the interlacing of the fibers of enamel rather than from any absolute increase of density.

The fact that hens must be fed occasionally on lime in order that shells may be formed cannot be regarded as adding any strength to the argument in favor of lime-assimilation. The shells of eggs cannot be held in any sense as organized products, and hence they bear no more relation to the hard tissues of the animal organization than a calcareous deposit in the mouth resembles the tooth upon which it is deposited.

That increased density can be affected by the presentation of food containing the necessary elements there can be no question, but that it can ever be accomplished by direct administration of the inorganic I hold to be impossible. Careful observation through a series of years in lime-water districts leads to the conclusion that assimilation cannot be carried on in this way, and that it is a waste of energy to attempt it. What changes the inorganic elements un-

dergo through the process of absorption and assimilation by the vegetable is a chemical problem yet unsolved; but that there is a change is evident from the results observed.

If the positions taken are accepted, they lead to the natural inference that the action of water as an element in the process of nutrition has not the influence ascribed to it. That it is the most convenient means to present certain substances capable of being held in solution is conceded, but that these, so held, are converted into solid tissue cannot be admitted by the writer. That water is an important factor in nutrition is accepted without question. That in one sense it is food, and is as essential in building up structure as more solid aliments, needs no argument, but that its facility in holding substances in solution is any aid to assimilation and nutrition must be regarded as an untenable theory.

The limits of this essay will not permit me to follow the physiological effects of water; these are well understood, and it would be simply an iteration of known laws to repeat them here. I shall, therefore, confine myself solely to the possible destructive action of water on tooth-structure, an action directly opposite to that of nutrition.

The extensive use of water makes it desirable for us, as dentists, to know how far it operates for good or ill in relation to teeth. I have already attempted to show that assimilation does not proceed through this channel, and if this position be conceded to be correct, it may be broadly asserted that water has only an indirect influence in the formation of tissue, and is not food in the strict sense of that term. Its therapeutic value is unquestionable, but that I do not propose here to consider. Its universal use, however, makes its local influence of very great importance, concerning, as it does, a very large proportion of the civilized world, and hence I have felt it of sufficient interest to give it more than ordinary attention, and to consider it as a proper companion-subject to that just discussed.

When it is remembered that the waters of the earth hold in solution many of the minerals, it is rather singular that so little attention has been given to the subject. The so-called mineral waters of this country and Europe have been celebrated for peculiar therapeutic properties, each spring having a distinct value in proportion as it contained certain determined ingredients in solution.

In Europe the drinking of these waters has been reduced to a system, and, as a branch of medical treatment, has assumed proportions so remarkable as to render it worthy of a special paper. The influence of Carlsbad, Ems, Wiesbaden, Pyrmont, etc., is not confined to the localities named, but is world-wide in its extent. The effect is visible in every town and hamlet in Germany. To

those who cannot go to the springs the springs are brought, and the long lines of pedestrians starting in the early morning hours, in every German city, for their drink of Carlsbad, etc., is proof of the fact, that at least they have faith in the curative properties of the fluid they despise so much as an ordinary drink.

The consideration of this fact, and of the necessary or possible pathological influence on tooth-structure, induced the American Dental Association of Europe, to appoint, in 1876, the author of this paper to investigate it. During that and the following year, this investigation was in part completed, and the results were given to that association in 1877.

As germane to the subject under consideration, I make extensive quotations.*

The specimens to be submitted to the action of the waters were carefully prepared; the bottles tightly corked, and then left for several months. Examinations were made at variable intervals, and a final one given under a low power of the microscope. Other means were also resorted to to mark any action that might have taken place. The results were as follows:

"*Carlsbad Mühl*" gave a very marked alkaline reaction. The tooth submitted exhibited not the slightest trace of injurious effects, the enamel and dentine presenting the same dense polished surface at the close as when first placed in the vial. The largest component part of this water by analysis is sulphate of soda. The next in amount is bicarbonate of soda, followed by chloride of sodium, carbonate of lime, with varying quantities of carbonate of magnesia, iron, protoxide of manganese, etc. This would give an alkaline reaction. In order to test whether the influence of the alkaline fluid had extended to the organic tissue of the tooth, it was submitted, finally, to the action of hydrochloric acid. The result was that not the slightest effect was visible. The cementum and dentine exhibited no loss of substance. As neither the inorganic nor organic elements had been affected, it was decided that positive alkaline waters had no direct injurious effect on any of the tissues of the teeth.

"*Emser Kranches.*" This is one of the wells of Ems. Analysis gives the largest amount in the bicarbonate of soda, followed in lesser amounts by chloride of sodium, carbonate of lime, carbonate of magnesia, iron, manganese, sulphate of potash, etc.

This also gave a marked alkaline reaction. Microscopical ex-

* The report from which these extracts are taken was withheld from publication on account of its incomplete character; the author desiring to embrace in his investigations a larger field. Circumstances not favoring this, they are here given as originally written.

amination failed to show any peripheral loss. The margins of a small filling intentionally left in the specimen were perfectly preserved.

"*Das Kissinger Bitterwasser.*" The bitter water of Kissengen. The analysis gave sulphate of soda, sulphate of magnesia, sulphate of lime, chloride of magnesium, chloride of sodium, etc.

The reaction of this water was decidedly alkaline, and the same absence of injurious effects was noticed here as in the others mentioned.

"*Kreuznacher Elisabeth.*" The wells of Kreuznach. Analysis yields the largest amount in chloride of soda, chloride of lime, carbonate of lime, chloride of magnesia, carbonate of magnesia, iron, phosphate of magnesia, etc. The reaction was alkaline, with no trace of injurious action.

"*Schwalbach Stahl.*" Steel waters of Schwalbach. The analysis gives bicarbonate of soda, carbonate of lime, carbonate of iron, protoxide of manganese, silicic acid, chloride of lime, sulphate of potash, etc. The reaction here was neutral when the water was first placed in the vial, but subsequently assumed an acid character. The action on the tooth was not very marked. The enamel was not perceptibly affected, and there was but a very slight removal of inorganic particles from the cementum.

It was very evident that a chemical change had taken place subsequent to immersion. This was undoubtedly caused by the penetration of air. As this is evidently not its normal character, judgment passed on the result must be fallacious. My opinion is that taken in its natural state it would not be injurious.

"*Driburger Stahl.*" Carbonic acid gas in large proportions; protoxide of iron, protoxide of manganese, carbonate of ammonia, carbonate of magnesia, sulphate of soda, sulphate of potash, chloride of soda, lithium, etc. Reaction slightly alkaline. Subsequently a chemical change took place, and an acid reaction was manifested. The cemental tissue was slightly acted upon. No action perceptible on enamel.

"*Aachener Thermal.*" Analysis: Chloride of soda, sulphate of soda, sulphate of potash, carbonate of soda, carbonate of magnesia, protoxide of iron, strontia, silicic acid, etc. Reaction slightly alkaline. In a few weeks there was a change from the almost neutral condition of the first period to that of a slight acid reaction. The effect on the specimen was not of marked character, but sufficient to show its injurious influence.

"*Pyrophosphor Saures, Eisenwasser.*" Knowing that much of the water drunk was manufactured, I included this in the examination. The reaction was neutral at the first testing. A subsequent test

gave a strongly acid character, much greater than any of the others subjected to this chemical alteration. The consequence was very great destruction of the inorganic elements. It is possible that this compound might be injurious to tooth-structure in the normal condition of the water. Further examination will be needed to decide this point.

"*Pyrmonter Stahlbrunnen.*" Alkaline reaction. No evidence of any action on tooth-structure.

"*Pyrmonter Salz.*" Alkaline reaction. No action on tooth.

"*Wildunger-Georg-Victorguelle.*" Alkaline reaction at the first testing. An examination four weeks subsequent to immersion, gave a slight acid reaction. The final result was some loss of substance in the cemental tissue.

"*Homburg Elisabethguelle.*" Reaction slightly alkaline at first examination. A change subsequently took place, and it assumed acid qualities. The destruction in the root of this specimen was greater than from any of the other natural waters.

"*Berliner Sauerbrunnen.*" The test here gave an alkaline reaction. No marked effect on tooth-structure at any period subsequent to immersion.

An examination of these details, imperfect as I know them to be, gives some results that are of interest. In all the waters possessing a strictly alkaline character, there was no action upon the tissues, nor was there any change in the water. They gave the same reaction throughout the period of observation. In those of neutral character change invariably took place, resulting in a more or less decided acid reaction. In proportion to the amount of acid were the tissues affected; this was most perceptible in the manufactured article.

In order to test the correctness of the often repeated theory, that all alkalines are intensely destructive to the organic portions of tooth-tissue, it will be observed that a tooth immersed in the strongly alkaline waters of Carlsbad was further subjected to treatment with hydrochloric acid. This, of course, removed all the inorganic elements, and would show the loss in the organic if any existed. The result proved very conclusively that there had been no action on this portion of the structure, and as there had not been the slightest previous effect on the inorganic elements, the conclusion was inevitable that alkaline solutions had no effect on these tissues. This result is confirmatory of experiments made years previous.

It must be borne in mind in judging of the effect of fluids on dead teeth, that devitalization predisposes to destruction. The power to resist injurious influences is lost in proportion to lack of vitality. So that while a tooth might easily be affected by destruc-

tive solutions out of the mouth, it might not be injured in the least when in normal position by the presentation of a much stronger acid. The counteracting elements exist in the alkaline saliva and in the vitality of the organ. In a mouth with the secretions normal, a slightly acid fluid would have no effect, but, on the other hand, were these abnormal, that is, giving an acid reaction, the destructive force would be multiplied.

It must be borne in mind that pathological conditions are frequently the primal cause of the great destruction in teeth. The equilibrium has been disturbed to the extent of an entire change in the oral secretions; unless these can be altered locally or systemically, there will be a continuous destruction manifested. Before arriving at any conclusion, whether a special case was or was not affected by the action of the water, the previous condition of the oral secretions should have been ascertained.

A result brought out in this investigation, while by no means new, recalls the fact that nearly all the tests made of oral secretions give a neutral response, and the investigation shows that neutral solutions change rapidly to acid. It seems to the writer that this furnishes the key to the problem that has surrounded and still surrounds the great destruction of tooth-tissue. A few hours' rest will effect an entire change. This may be produced in any depressions or between teeth, or the entire series may be acted upon during sleep, and this is the period of greatest destruction. The whole question might profitably be considered here, whether some simple means could not be resorted to to counteract this effect, but that is not included in the scope of this paper, and is merely alluded to as of suggestive interest.

The inference to be arrived at from the examinations here given, is that there is no local destructive action by the ordinary waters that are found upon the earth's surface.

THE VALUE OF THE DENTAL PULP AT DIFFERENT PERIODS OF LIFE.

BY D. D. SMITH, D.D.S., M.D.

(Read before the Pennsylvania State Dental Society, July 27, 1881.)

In view of some of the more recent methods of inserting artificial teeth advocated, the subject chosen for discussion in this paper assumes a position of importance greater than its title may seem to indicate. It has been selected in the hope that future investigation and research may evolve some rational and definite methods of dealing with the pulp which shall be more certain and satisfactory than those of the past.

The general teachings in regard to the dental pulp would lead to the belief that it is an organ to be conserved, entire or in part, under any and all circumstances where preservation is deemed possible. Are such teachings the result of true scientific investigation, and in accord with observed and established phenomena? To form just conclusions in this matter it will be necessary to consider briefly the structure of the teeth, to study carefully the office of the pulp, and to observe accurately the part which it plays in the formation, growth, and development of the teeth; for failure to rightly apprehend these things has, we believe, led to errors in the teaching and practice of the past.

The recent theories of tooth-genesis cannot yet be regarded as confirmed and beyond question, neither are they in conflict with observation and established facts to an extent to justify a conclusion that they are altogether erroneous. We therefore accept as it is taught in Prof. Garretson's "Oral Surgery," third edition, that all the osseous structures of the tooth—enamel, dentine, and cementum—are formed and deposited by the dental pulp, the first appearance of which is said to be a papilla or dental germ, found in proper relation between the plain cartilage representing the jaw and the membrane covering it, at about the sixth week of intra-uterine life; that this papilla, as it enlarges, assumes the form of the tooth which it represents, and that it oozes out materials at the proper time for building the enamel, dentine, and cementum; that for the dentine being deposited directly by the pulp, while that for the enamel and cementum is transformed into these substances by the membranes enveloping respectively the crown and root. The enamel is said to have two membranes, called by Garretson tunica propria and tunica reflexa, both having, according to this author, a common origin, viz.: the mucous membrane overlying the primitive dental groove. Whether this theory of tooth-genesis be accepted in whole or in part, there are facts which justify the conclusion that the pulp is *directly* and *alone* concerned in the production of dentine and enamel. The visible evidences are the relations of these substances to the pulp, and the fact that they are nourished and changed in the fully formed tooth, if nourished and changed at all, by the direct agency of the pulp. With the extirpation or death of the pulp, not only is all sensation in dentine and enamel at an end, but all vital change, all processes of recuperation, consolidation, nutrition, or waste, are likewise stopped beyond the possibility of revivification. While it is improper to speak of a pulpless tooth as a "dead tooth," it is certainly not inaccurate to characterize the enamel and dentine of such a tooth as "lifeless" or "dead." Such practically they are.

Reasoning from similar premises, the inference might justly be

drawn that the cementum is not built directly from the pulp; for while the relations of the cementum with the pulp are not more remote than are those of the enamel with that organ, unlike the latter, its vitality, nourishment, and support in the fully formed tooth are not dependent on the pulp. A tooth may be pulpless and its dentine and enamel deprived of all vitality, yet possessed of living and, so far as we know, normal cementum. This is due to the fact that the cementum in the fully formed tooth derives its nourishment not from the pulp, but from the same source as other bone-tissue, viz.: the periosteum of the tooth, or, as this membrane has more recently been characterized, the peridentium, periodontium, or pericementum. Thus we understand why a pulpless tooth, with dentine and enamel practically dead, is still tolerated, retained, and remains useful for years. The cementum of the tooth in intimate relation with the alveolar socket, deriving *its* life and nourishment *not* from the pulp, but from the pericementum, maintains its vitality and equipoise as though the pulp were still living.

These then are the facts to be emphasized: whatever organ or tissues are concerned in the original formation of the osseous structures of the teeth, in the fully formed tooth the pulp is the only nourisher of the dentine and the enamel, and the pericementum, of the cementum; that pulp-tissue may be deprived of all sensation and extirpated, thus destroying the vitality, nourishment, waste, and repair of dentine and enamel, while the cementum may still possess all its vital functions.

[The statement that a tooth with devitalized pulp is never the subject of exostosis was here shown to be incorrect.]

Some of the worst cases of dental exostosis have been those of roots of teeth for a long time devoid of pulps.

If it should be objected that in some teeth with devitalized pulps there is, after a time, marked recession of the gums and process from their necks, an explanation may be found in the fact that the cementum in many cases becomes so attenuated towards the coronal end of the root as to lose the marked characteristics of bone,—the lacunæ and canaliculi—and is thus wanting in power to maintain that permanent vitality which is found in situations where the lacunæ and canaliculi exist.

If it be inquired, will the vitality of the cementum of pulpless roots always be maintained in the thicker portions where the lacunæ and canaliculi exist, the reply will be, that it will not. Absorption of the alveolus and gums will sometimes go steadily on from about a pulpless root, until the whole root is exposed or even necrosed. The cementum in such cases being bound in the most intimate relations with a corpse (for such practically the dentine of a pulp-

less tooth is) will yield up the life which it derives from the pericementum more or less rapidly in proportion to the density of the contiguous dentine, the disposition made of the devitalized pulp-tissue, and the treatment of the pulp-cavity.

The value and importance of the tooth-pulp at different periods of life, viewed from this point, becomes a practical subject, affecting as it does the durability, prognosis, and treatment of the teeth, as well as the process of their formation and consolidation and their structure.

If we examine the teeth of childhood and youth, whether temporary or permanent, we find them possessed of certain characteristics pertaining quite uniformly to this period of life. If we examine the teeth of sound and robust maturity, we find also quite uniformly certain characteristics pertaining to teeth with living pulps belonging to that period. An examination of the living teeth of old age will disclose peculiarities quite as distinctly marking this period of life as those of childhood, youth, and maturity.

The characteristics of the teeth of youth are, dentine and enamel comparatively soft and unconsolidated, and of exalted nervous organization; preponderance of animal matter throughout the tooth, with lime-salts lacking both in quantity and arrangement, and all yielding readily to decay in localities favoring the action of external destroying agents.

What then is the meaning of a living, healthy pulp in a tooth of this character? It means to that tooth an increase in amount, and a more perfect engagement of the lime-salts, an obliteration of nervous exaltation, the establishment of a just equipoise between animal and earthy elements, the consolidation and binding together of the enamel rods and dental tubules, and increased ability, as if by firm compact of all the tissues, to resist the encroachments of external chemical agents. The pulp being the builder, nourisher, and sustainer of the dentine and enamel, its preservation in health and entirety to the young, unconsolidated tooth, is of paramount importance. No organ takes up this work when the pulp lays it down; by no vital process can the dentine or enamel be changed or nourished after the pulp is destroyed. A devitalized pulp means that the tooth sustaining such loss has passed beyond the influence of any systemic process, whereby it can be in the least improved in its organic structure. As these structures are when the pulp ceases to nourish, so must they remain, with no possibility of change for the better. The younger the tooth or the more imperfectly formed and consolidated, the more unfortunate to that tooth is the death of the pulp.

[Accidents to incisors of children and the frequent exposure of

pulps in sixth-year molars from decay were here cited as illustrating the great importance of the pulp in young teeth.)

To the healthy pulp alone, then, we are to look, and upon it we are to depend, for that gradual but sure process of nutrition, by which a more solid and complete union of the elemental tissues of the young tooth is secured; it alone can and does produce that perfect organization of dentine and enamel, flint-like in character and effectually resisting destroying agents, so often seen at the period of maturity. The importance of a living, healthy pulp until the time when the tooth reaches its maximum of consolidation and solidity can not be overestimated.

Let us now pause and inquire if the pulp which has passed the various stages of tooth-formation and effected its legitimate work in the organization, arrangement, and solidification of the enamel and dentine is of the same utility and value as in the earlier periods of formation and nourishment. Undeniably it is not of the same value, for having completed those nutritive changes which have resulted in the most perfect form of tooth-organization attainable under the circumstances, the pulp seemingly rests from its labors for a time, and only takes on activity again when, later in life, it becomes to the tooth an organ of destruction as it was once the organ of construction. How frequently is it observed that teeth with living pulps which at maturity and on to the period of systemic decline were dense, strong, and decay-resisting, in old age speedily become fragile or soft and readily yield to decay.

The pulp being the only organ which is concerned with the organic functional relations of enamel and dentine, must be directly chargeable with disturbing that perfection of organization and arrangement which existed when the tooth was at its maximum of density and resisting power. Does then the organ which was once the architect and builder of the tooth become, later in life, a party to its disorganization and dissolution? From what has been said and from the phenomena observed in living teeth at different periods of life, we seem irresistibly impelled to the belief that a living pulp *may* become a prime factor in the disintegration of its surrounding osseous structure, and if this be true, is it advisable or even justifiable to attempt the preservation of affected pulps in mature and well-organized teeth? And may we not resort to extirpation, even in sound teeth, when necessity or convenience seems to require it?

To summarize this subject, then, we find that a living and vigorous pulp within a young and imperfectly consolidated tooth is of the greatest importance to that tooth; that its conservation is to be sought in all operations upon the tooth; that when the vital processes of calcific consolidation are completed, the destruction and ex-

tirpation of the pulp is of little practical detriment to the tooth; and that in the decline of life the pulp *may become* the means of undermining the solid and resisting combinations found at maturity, thus exposing teeth which have passed the formative, consolidating, and quiescent periods to rapid decay.

REGULATION OF TEETH MADE EASY BY THE POSITIVE SYSTEM.

BY J. N. FARRAR, M.D., D.D.S., NEW YORK CITY.

(Continued from page 80.)

No. XIX.

Straggling Teeth—Lateral Movement of Roots and "Righting-Up" of Crowns.

Teeth are sometimes in that condition of irregularity that they may be designated as "straggling." The chief peculiarity of these teeth lies in the fact that, without having been crowded, or even in contact with other teeth in the same jaw, during the process of their development or after their eruption, they have strayed away from their proper places in the dental arch, and taken positions more or less isolated from others. These stragglers may be divided into two classes. In one the crowns and roots are both misplaced; in the other the crowns only. As a general rule, the displacement of the former class takes place during the period of their eruption, while the irregularity of the latter class is the result of the falling away of the crowns from their proper positions after eruption, leaving the apices of their roots comparatively undisturbed.

The first class is, perhaps, more noticeable in cases of children who have prematurely lost two or more contiguous temporary teeth, and where some of the permanent teeth have encroached upon the territory belonging to their next neighbors, which, besides occasioning an unsightly appearance, more or less interferes with the eruptive process of those beneath them, so that they are not only retarded in their development, but are often led astray in such a manner that if they erupt at all, it is at one side of their proper positions in the arch. Perhaps a clearer apprehension of my idea of this group of abnormalities may be had by recalling to mind special cases, such as where premature loss of all the upper incisors is followed by the encroachment of the permanent central incisors upon the territory belonging to the laterals, or cases where the premature loss of the two contiguous temporary molars and the cuspid (say of the lower jaw) is followed by the eruption of the first bicuspid (which generally occurs first) in the place belonging to the cuspid, or, perhaps, in the place of the second bicuspid, thus interfering with

if not actually imprisoning the cuspid or second bicuspid, as the case may be, so that if assistance by artificial means be not given to force the intruding tooth out of its way, it is compelled to strive for its liberty as best it can, and, if successful, the escape is often behind or in front of another, and out of its proper position. While the cause of the straggling of some of these teeth is plainly apparent, that of others may not only be difficult to understand, but sometimes only possible to explain in a hypothetical way. The hypothetical explanation of the cause of straggling of these teeth during their process of development after the premature loss of two or more contiguous predecessors is, that in the abnormal excess of alveolar territory that exists under such circumstances, with nothing positive like adjacent teeth to guide them into their proper places, in their comparative freedom of latitude they are influenced by the least pressure or obstruction to go astray along the line of the least resistance, so that, when they erupt through the gum they are often found to have more or less encroached upon the territory belonging to others.

The cause of the straggling of the second variety may also be difficult of apprehension, but, as a rule, it is simply the result of misdirected force, incited by improper antagonism with the opposite teeth. Much might be said in regard to the prophylactic management during the period of development of teeth to show how this as well as other forms of irregularity may be prevented, but as this phase of the subject is not strictly relevant here, and as it can be better treated in a separate paper, we will pass it. While all that is necessary with the teeth of the second class (only the crowns of which are misplaced) is to apply some force that will right the crowns, leaving the apices of their roots comparatively undisturbed, the teeth whose crowns and roots are both misplaced, require to be moved laterally bodily, which is sometimes a difficult operation. Contrary to the usual appearance of teeth belonging to the second class, and which are generally found in an attitude inclined to or from others, those of the first variety, although isolated from others, are often found (comparatively speaking) in a perpendicular position, and parallel to others that are in their proper places, so that, were it not for their interference with others underneath them, it might often be as well to let them remain as they are, rather than to simply move their crowns, leaving their roots undisturbed, as such a half-way sort of treatment would cause an unsightly inclination not altogether different from that of the other class. The lateral movement of interfering roots, through the alveolar process, has been supposed by some persons to be impossible. How this movement can be effected by the proper application of the principles of the positive system is the main object of this paper.

The secret of the lateral movement of roots lies in firmly fixing the articulating ends of the crowns of the teeth to be acted upon while force is being maintained at their necks.

There are two reasons for attempting a change in the condition of straggling teeth; the first is for the purpose of making room for others that are in process of development; the other is purely a matter of esthetics. It is always well to exercise due consideration before adopting artificial mechanisms in the management of straggling teeth for the simple purpose of clearing the path for unerupted adjacent ones. For, unless teeth encroach too much upon the territory of others not yet erupted, the stragglers will generally be caused by the mysterious forces of nature to move out of their way, as the rightful successors of the lost temporary teeth approach, provided there is room on the opposite side of such strayed teeth. As a rule, if these teeth do not encroach more than one-thirty-second to one-sixteenth of an inch upon the path of others, assistance by artificial means is unnecessary. But, if the encroachment be more than one-thirty-second to one-sixteenth of an inch, experience teaches that some artificial auxiliary generally becomes necessary in proportion to the increase of displacement over and above this measurement, in order to prevent the eruption of other teeth above or behind, and to prevent them from being otherwise led astray, or, what is worse, permanently arrested within the jaw. Rudimentary teeth, especially if feeble and abnormally small, do not require much interference to throw them out of their proper course, arrest their eruptive progress, or even change them from a physiological into a pathological condition of development.

While the method of treatment may practically be the same for all variations of the first class, different conditions of the roots, and different degrees of hardness of the alveolar process at different ages of the patients may make differences in the labor and length of time necessary to success; and when these considerations are taken into account, with other circumstances of the patient, the question of advisability may arise as to whether it will be prudent to attempt any treatment whatever. What can be done and what it is prudent to attempt may be two different things. A long root is not so easily moved as a short one, and a root that is fully developed will not move as easily as one that is not, for the reason that the longer it is the greater is the amount of alveolar tissue to be acted upon, and, consequently, the greater the resistance to overcome.

A knowledge of the position of the apices of the roots of teeth is one of the first requisites to a clear comprehension in all cases, in order to proper treatment; for upon this depends the question of the

highest esthetic possibilities. This vital point is often overlooked by young operators, and sometimes by older ones.

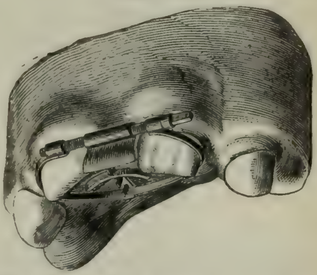
While the mechanical requisites for moving roots may sometimes be more difficult of manufacture than those for the simple movement of the crowns, it is not always so. Indeed some machines are very easily made, and the subsequent operation is as easily performed. Leaving more difficult cases for future consideration, we will only speak of this kind at present.

There may arise an inquiry within the minds of some of my readers as to whether or not it is proper to move teeth before the completion of their development and the entire calcification of the roots, for fear of incurring the risk of their distortion. I purpose in my next paper to examine this question.

As is well known, the direction of motion and degree of power necessary in mechanical leverage depend not only upon the length of the lever but upon the position of the fulcrum, and the distance between it and the points of power and resistance. In the simple movement of the crowns of teeth the apical extremities of the roots of which are already in their proper position, the operation is always based upon that law of mechanics which places the fulcrum between the points where the power is applied and that of the resistance. (See Z, Fig. 118.) But, on the contrary, in an operation for the lateral movement of roots of teeth the power should be placed between the fulcrum and the point of resistance. (See Z, Fig. 119).

As an illustration of the perfect simplicity of some operations for moving the entire tooth, attention is invited to one of my favorite methods, adopted in the case of a boy who had lost his four upper temporary incisors, and whose permanent central incisors had straggled and erupted one-fourth of an inch apart, so that they were not only unsightly, but interfered with the development of the lateral incisors, leading them astray from their proper eruptive course.

Fig. 117.



Operation for laterally moving the apices of the roots of teeth.

Fig. 117 illustrates the front portion of the upper jaw in this and similar cases as they appeared when the apparatus was first applied, and also beautifully shows how it is sometimes possible that the same power from the same device, when continued to be used at the same points throughout the entire operation, can be made to act very differently upon different portions of the teeth and sockets at different

stages of the operation, by an automatic shifting of the place of the fulcrum, so that the direction of the force by the leverage becomes reversed. As these mechanical appliances are equally adapted to teeth the roots of which are partially as well as to those which are wholly developed, I will, in order to simplify the explanation of the philosophy, assume that the teeth acted upon are fully developed, leaving the consideration of the question of the movement of partially developed roots, as before mentioned, for the next paper.

Fig. 118.
First position.

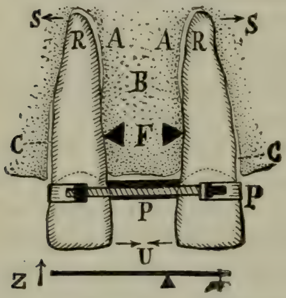
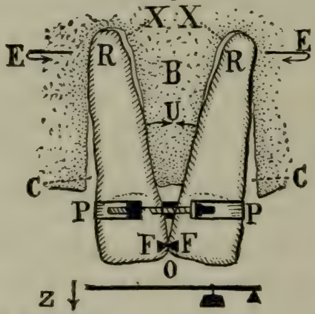


Fig. 119.
Second position.



First stage of the operation.

Fig. 120.
Third position.

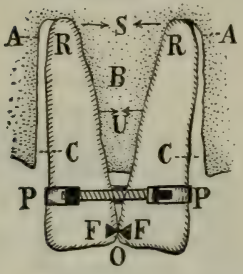
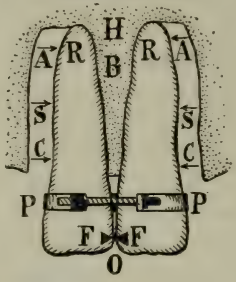


Fig. 121.
Fourth position.



Second stage of the operation.

In the treatment of such cases (Fig. 117) where the roots as well as the crowns are out of their proper position, it may become necessary at difficult stages to adopt the principles of both rules of leverage philosophy. To make the matter plain, let us refer to four ideal figures, 118, 119, 120, 121, which diagrammatically illustrate four successive stages in such a treatment. Let B represent the alveolar process; R, R, central incisors (straggled); P, gold clamp-bands operated with a screw; F, F, fulcrum, or places of the fulcral bearings; C, C, X, X, places where the teeth have separated from the socket-walls, the arrows indicating the direction of the movement

of the different portions of the teeth at different stages in the operation that caused the "spaces," and we shall soon see how simple it all is. Now, if the septum, B, Fig. 118, which acts in a measure as a fulcrum, be hard and unyielding, and the alveolus about the apices of the roots be soft, the force of the clamp-band about the necks, as shown, would cause the apices of the roots, R, R (if fully formed and calcified), to move in the direction of S, S, causing separations from the socket-walls at the opposite sides, A, A.

It should, however, be remembered that, in actual practice, instead of the septum being a positively unyielding substance, it undergoes more or less absorption, and possibly some condensation, especially if the applied force should be greater than is required to cause absorption. The effect of this reduction of the fulcrum (septum) under the pressure of the dental lever is to reduce materially the degree of inclination of the crowns referred to. The real attitude of the teeth, after such alveolar changes, is approximately shown by Fig. 119.

Under such circumstances any force applied to the crowns of the teeth that would be sufficient to draw them in contact at the point O (Fig. 119), would cause separations between the necks of the teeth and socket-walls at the points C, C, on one side, and the opposite movement of the apical portions of the roots (if calcified) would, through this play of the different arms of the lever, cause other separations on the opposite sides of the sockets at X, X; both of which "spaces" would increase, as the case would advance, until the crowns were brought in contact, as shown.

The first stage in the operation is now completed, and the time for the next has arrived. The object of this second stage is to produce approximate parallelism of the teeth, by causing the apical portions of the roots to approach each other. At this point the curious change, before referred to, takes place in the play between cause and effect, for, by the same power from the same apparatus, the forces act upon the apices of the roots to cause them to return and travel in exactly the opposite direction. (See E, E, Fig. 119, and A, A, Fig. 120.)

This change in the direction of movement of the apical extremities of the roots is brought about from the fact that the moment the crowns are brought in contact at the point O,—at that same moment, if the power of the clamp-band be continued, the fulcrum automatically shifts from the position about B in the septum to the point of contact of the crowns at O. This shifting of the fulcrum changes materially the philosophy of the leverage, by placing the power between the fulcrum and the point of resistance, instead of outside of it. (See Z, Z, Figs. 118, 119).

Fig. 120 illustrates the relative changes in position between

the teeth and sockets at a little later period in the operation, and Fig. 121 the appearance at its close. The spaces formed by separation of the teeth from the sockets fill in with new, but soft tissue-formations as fast as the teeth move. The yielding nature of this new deposit of tissue is the reason why regulated teeth are loose for a considerable length of time afterward, and suggests the reason why they should be kept steady until sufficient time shall have elapsed for calcification. The mechanism which I use in such an operation, as shown by Fig. 117, and the one illustrated separately from the cast by Fig. 122, is made up of two parts; a clamp-band, to draw the teeth together, and a lock-portion, to hold stationary the cutting-edges of the teeth; but while the crowns of the teeth are being drawn together, only the band portion need be used.

Fig. 122.

Apparatus for laterally moving roots of teeth.

On each extremity of a band, made light and strong of rolled wire, is soldered a nut, one of which is screw-cut. Through these nuts passes a little gold screw, having a head fitted to a watch-key. The main point to hold in view in constructing this clamp-band portion is to insure a close bearing at the gum border, to prevent it from slipping off the teeth. The lock-portion, for preventing the overlapping of the crowns when the force is continued after the teeth have been brought in contact, is a simple device easiest made by bending a small piece of plate, about one-fourth of an inch square, or a little larger, trough-like, so as to fit the edges of the teeth; to this is soldered, at right-angles, another piece of plate, extending far up between the teeth nearly to the gum; on the upper end of which is soldered, transversely, about one-eighth of an inch of small tubing, (smooth bore) through which passes the bolt of the clamp-band, and from which it is loosely suspended. This trough-portion may be differently constructed (skeleton-like), as shown by Fig. 122, which is more easily kept clean.

The clamp-band portion is first applied and worn, the force being intermittently applied two or more times per day, or every time the band loosens by the movement of the teeth; but this should never be made powerful enough to cause pain. After the teeth are brought in contact, or nearly so, the trough-portion is added, and the force of the clamp-band is continued until the roots are brought into the desired positions. This is one of the easiest and simplest operations imaginable, and compared with the old-fashioned methods, which often resulted in total failure, the operation being pronounced an impossibility, it is another of the many illustrations that regulation of the teeth *is* made easy by the "positive system."

After these operations, I have been in the habit of using the same device for retaining the teeth in position for several weeks, until they become sufficiently firm in their new quarters. It is not necessary, however, that such teeth shall be kept in "splints" until the unerupted teeth are in sight. A slight encroachment, as before-mentioned, will do no harm.

Should it become difficult to retain the apparatus in position on account of the inclination of the teeth, it may be held in place by the friction of a little triangular elastic rubber cushion tied to and through the upright piece of plate between the teeth, so as to fit the V-shaped space between the crowns.

To prevent accumulations of food, the apparatus should be removed and cleansed every day after the teeth are in position, an operation requiring but a few seconds by the patient.

(To be continued.)

PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

Regular meeting at the house of Dr. S. G. Perry, Dec. 20, 1881. President Perry in the chair.

Incidents of Office Practice.

Dr. Benj. Lord. I saw to-day a lady whose superior incisors and canines were filled with gold twenty-eight years ago, and though the cavities were quite large, and she was then only twelve years old, the teeth are perfectly preserved. Such a case of unusual success may very properly excite our curiosity, and lead to inquiry as to the cause.

Besides the perfect placing and impacting of the gold, and the nice finishing of the edges of the filling, the necessity of which must be acknowledged, I believe the durability of the work has been due to the shaping of the teeth so as to leave free spaces, yet with a point of contact at the cutting-edges. This shaping made the spaces self-cleansing.

It was formerly my practice to wedge the teeth apart preparatory to filling. Now, and for a long time, I have felt that it was far better to cut away the approximal surfaces so as to secure such a space as I desired to leave after the teeth are filled. If further space is required for the operation of filling I get it by wedging.

I believe that the cause of much failure is the practice of wedging from the beginning to get space for filling, after which the teeth

fall together again, and further decay will be almost certain to occur, as at least one of the conditions that favored it in the begining is not removed.

In the treatment of the approximal surfaces, I think we must make provision to secure such free spaces as, for the most part, will be cleansed by natural causes, for we cannot depend upon our patients' keeping their teeth clean on these surfaces.

Dr. J.W. Clowes. That is righteous doctrine, but it is not popular.

Dr. J. Morgan Howe. After Dr. Arthur's book was published, I became convinced, for a time, that the separation of teeth was desirable, and I practiced it to a limited extent, and very cautiously, treating some teeth in some mouths as nearly as I could after the manner recommended by him. I carefully watched the cases in which I had so acted, and after a lapse of two or three years, and by further cautious experiments in that direction, came to the conclusion that this treatment of the incisor teeth was certainly judicious in some cases, but my experience with the bicuspids and molars was not favorable to that method of treatment. I not only treated some other persons' teeth—their bicuspids and molars—in that way, but I had one or two in my own mouth thus separated. The operation was not successful either in preventing recurrence of decay or in giving me comfort, and I submitted to an operation last summer that was very tedious and exhausting, in order to have the contour of those teeth restored. My experience with incisor teeth has been rather favorable, where discretion is used in selecting cases, but bicuspids and molars should not, according to my experience, have their contour destroyed.

Dr. Dwinelle. It is a maxim that we learn more by our failures than by our successes. I have to report a failure. To-day a lady came to me, for whom a year ago I filled a large number of teeth. Her teeth were exceedingly sensitive to inhalation of air, and to cold water also. I treated them in the method I have reported several times before this society, with chloride of zinc, applying it with a heated instrument. This treatment has been very successful in nearly all cases. She came to me recently, however, with one tooth that had given her much trouble. It was a superior twelfth-year molar, on the left side, having a cavity in the posterior approximal surface. It was exceedingly sensitive, and ached so frightfully that I could hardly do anything with her. The tooth resisted treatment so long that I came to the conclusion I would destroy the pulp, and was not opposed. It was either that or remove the tooth. I destroyed the pulp, removed it, medicated the pulp-canals, let the tooth remain for several days, and then filled the canals to their extremities. The tooth had three roots, though they were

nearly united in one. She came to me early this morning suffering beyond expression. I made a series of external applications, but with no effect. I finally treated with chloroform. This afternoon she came back, and I must confess that in all my practice I never witnessed such exquisite and excruciating suffering. She entreated me to remove the tooth. I did so, though against my wish. I found these aggregated roots cemented together so that I could hardly trace the outlines which would express the treble form. I cut the tooth open, and found that I had filled the roots perfectly to the foramina. I expected to find the pericementum inflamed and highly colored. To my surprise it was pale and bloodless. I must confess it is a puzzle to me. I believe I have had as much experience as almost any one in the last forty-odd years in treating teeth, and I must confess that the cause of this pain is unaccountable.

Dr. Rich. Was there any bone on the outside?

Dr. Dwinelle. No, sir; nothing that would show deposits of secondary dentine.

Dr. Bödecker. There may have been some new formation of bone on the bony wall of the socket.

Dr. Dwinelle. That might be, I suppose; I only know there was none on the tooth.

Dr. Rich. I have no doubt that in many cases of that kind, if the socket were examined carefully, small spicules of bone would be found protruding from the walls. I will describe one or two of the cases of that kind that have occurred in my practice. The subject of one of them was the daughter of an eminent physician of this city. Her teeth had been continuously under my care from her childhood. She grew up a fine, healthy, robust girl, with large, regular, fine teeth, which she kept in good order and was very proud of. When she was about twenty years of age she complained of an occasional severe pain in the right superior first molar. She consulted me about the trouble the tooth was giving her, and I made a careful and thorough examination of the offending member, but could not discover any cause for the pain she was suffering. The tooth was perfectly sound, not a speck of decay about it, and not at all sore to pressure or percussion. The application of a current of electricity gave no indications of a dead pulp. The intervals between the periods of suffering became shorter, and within six months after its first appearance it became continuous, and the torture from it was almost unbearable. She could not sleep except when under the influence of narcotics, became extremely nervous and irritable, and the derangement of the system became general. She lost her appetite, and ran down in health and flesh very rapidly, and her condition became a source of great anxiety to her family. During all this time

she was under the care of her father, a most skillful physician, who tried every means available to relieve her and enable me to save the tooth. The symptoms were something like those that occur when there are osseous formations going on in the pulp, and with the idea that possibly that might be the cause of suffering, I destroyed and extirpated the pulp; no such formations were found in it, and no relief followed the removal of the pulp. I then extracted the tooth. The pain and nervous irritation immediately disappeared, and the patient rapidly recovered her health and good looks. When I looked at the tooth after taking it out, I found a part of the ruptured membrane was still attached to the palatal root; upon examining this under the microscope I discovered three points of inflammation in different parts of the membrane that remained on the root, about the twentieth of an inch in diameter. With this exception the membrane had the appearance of being strong and healthy, and except in these spots was entirely free from inflammation. From some previous experiences these spots of inflammation, and the general character of the case, suggested spicules in the socket. The day after the tooth was extracted I made a very careful examination of the socket, and found not only the three that corresponded with the points of inflammation discovered with the microscope, but a number of other small spicules in that and the sockets of the other roots. A few months after the extraction of the tooth I have just mentioned, the same symptoms were developed in the first superior molar of the left side. In the case of this tooth, as soon as the symptoms were well ascertained to be identical with those attending the commencement of her suffering, the tooth was extracted, as the patient would not undergo a repetition of the torture experienced with the first one. And by this process this young lady has lost four of her upper molars during the past five years, the first and second molars on each side. As yet none of the other teeth have been affected in that way.

Dr. Bödecker. I do not believe this formation is so very exceptional, because I know when studying alveolar abscess I found several cases where there was a new formation of bone sticking out of the alveolar process. Some of these were quite sharp and pointed, while others were blunt. I know I have seen several of them.

Dr. Wm. Jarvie, Jr. These cases of intense pain from obscure causes bring to mind a case in my hands of a lady of forty years of age, who had been suffering from neuralgia for six or eight months, and had been under the care of a physician. The pain was felt through the cheek and over the eye and on the side of the head. Her sufferings were intense at times, and she lost some forty or fifty pounds of flesh in the meantime. She told me life had become a

burden. Her physician suggested that probably there might be some connection between this pain and the teeth, but she thought it could not be possible, for her teeth were all comfortable. She came to see me on his advice, and on questioning her very closely and examining her teeth, I found a suspicious looking filling in the second lower bicuspid on the side of the mouth where the pain had been. I removed the filling, which came out very readily, and a little pus the size of an ordinary pin-head exuded from the cavity. This was the seat of the trouble, for in three minutes her pain had disappeared, and she has not had a return of it since. I treated the pulp at that time with warm water and then applied a little creasote; after that I put in some arsenic, destroyed and extirpated the pulp, and filled the tooth. She has never had a return of the pain. Only this afternoon she said her life had been a changed one since that time.

In Dr. Dwinelle's case, it seems singular that there should have been such great pain, the pulp-canal being cleared out and filled, and there being no inflammation of the periosteum, and yet it may have been caused by spike-shaped nodules on the alveolar process. I have never met with such a case in all my practice, though I have frequently had cases of pulp-stone in perfectly sound teeth, where the pain has been as intense as any pain could be.

Dr. W. T. LaRoche. About fifteen years ago I had a case of a second bicuspid, which gave such constant and acute pain that I finally had to resort to extraction in order to give relief. The tooth had a small filling on the grinding surface, which I removed and replaced a number of times without relieving the pain. Upon extraction I found attached to the root of the tooth small spicules of bone like those described by the gentlemen to-night.

Dr. J. L. Williams, Boston. In Dr. Dwinelle's case, possibly the sensitiveness to pain might have resulted from a neuralgic diathesis. It reminds me of a similar case in my own practice where that condition seemed to be the obstinately controlling element.

It occurred, perhaps, twenty years ago. A man of nervous temperament, who had been very busy in his profession, day and night, for some time, was attacked with severe odontalgia, accompanied by symptoms of brain fever, which made him almost insane. I tried, in vain, all sorts of ways to stop the pain, and, as a last resort, at his entreaty I took out the tooth. I then invited him to have it replaced, but nothing would tempt him to have it back. Since then he has said he would give five hundred dollars for that tooth. It was a case of remarkably nervous temperament, much aggravated by excessive brain-work, in which the neuralgic tendency seemed to have taken control. Perhaps the lady referred to might have been

of that temperament, and the working on the tooth might have produced hyperesthesia in that locality, which resulted in the neuralgia.

Dr. Dwinelle. She is of nervous temperament, but not unusually so. It occurred to me that, perhaps, the trouble might arise from cold and general congestion. I told her I had cured toothache by a single dose of cathartic medicine, and asked her if she needed anything of the kind. She said she was entirely normal, and there was nothing needed in that direction. There was nothing to indicate it. There were no febrile symptoms, no congestion about the head or eyes, and the pulse was normal.

Dr. W. H. Allen. In connection with the suggestion made by Dr. Williams in regard to putting teeth back after extraction, I will mention a case I had some time ago. A young woman, who had been treated for several days or weeks by some other practitioner for pain in a bicuspid, came to me, one Sunday, in severe pain, and wanted the tooth out, and mentioned that it had been treated for some time, but nothing relieved her of the pain. I made several applications but could not relieve her, and finally decided to take the tooth out, and did so. I cleansed the tooth, removed the pulp, filled the canal, chamber, and crown, and reinserted it in its original socket, and in about thirty minutes from the time the tooth was extracted she left the office rejoicing that she still had the tooth and no pain. I have not seen it for some time, but for several months it was doing very well and giving her no pain or trouble.

I will mention another case I have been practicing upon for some time, trying to save a pulp. A lady came to me, saying she had severe pain in a lower wisdom-tooth. I found a large cavity in the buccal side of the tooth, stuffed with cotton; removing which exposed the pulp, which was much inflamed and very sensitive. I treated it a week or more, trying to get it into a proper state to be filled, and to-day, when she presented herself, I thought I had succeeded, as she said she had been free from pain for twenty-four hours; but as soon as I removed the temporary stopping intense pain commenced; there was a slight exudation of pus and great sensitiveness to the touch; indeed, it seemed as sensitive as before I had treated it, and I reluctantly resorted to the use of arsenic.

The Secretary then read the following paper on "Simple Operations," by H. C. Quinby, Liverpool, England:

If one were to judge of what our profession is doing by its current literature, he would say that nothing but grand operations is ever attempted now-a-days, and while I would not have it supposed that I do not fully appreciate such operations as I see described, I wish to protest against what seems to me a growing tendency to make our work as

complicated and laborious as we can, requiring not only the utmost exercise of skill, but, from the nature of the operations, a degree of physical power that, if in constant demand, would be a greater tax upon our endurance than the strongest of us could stand. Try as we may, we cannot quite convince ourselves that our patients are insensible blocks of wood, and, while brain and muscle are laboring to execute the operation in hand, we are often called on to exert all the will-power we possess to control the timid and nervous patient who wants our services, yet dreads the ordeal.

We all of us have cases where the earnest desire of patients to have the best work that can be done for them is sufficient to induce them to put forth all their own powers of self-control to endure unflinchingly what we require of them and give us intelligent and appreciative aid in our efforts. In such cases, let us, for our own sakes, try what skill we have, remembering always, however, that it is our duty to consider whether the more complicated operation is really better for the patient as well as for ourselves. But we all know, too, that, as a rule, those who want our services most are the weak, the delicate, the nervous; that in fact the more pressing the demand for our services the greater is the amount of suffering the patient must be called upon to endure; and yet the power of endurance is weakened by the same cause that has made our services necessary: in other words, teeth decay most rapidly when people are weak and ill; therefore our services are often most urgently needed when the strength of the patient is at low ebb, and it is in these cases that simple operations are not only more bearable but more effective and more lasting.

There was a case most admirably described in the DENTAL COSMOS a short time since, where the whole or the greater part of a central incisor needed restoration, and I am sure the operation when completed must have been most satisfactory to both operator and patient, but let us see what both have to do and to suffer. We prepare the root, get a porcelain crown satisfactorily fitted, and then proceed to build up with gold the lingual surface of the tooth to its original form. We shall probably put our patient into a chair that will allow us to raise the seat and then depress the back, so that the patient will be in a reclining and nearly horizontal position, three feet or more above the floor, in fact, as nearly as possible as though lying on a surgeon's operating table; then we proceed to fix a sheet of rubber dam, having cut away the gum freely so as to get the rubber well up on the root; perhaps an automatic saliva-ejector is then set in operation and its syphon hung to the patient's mouth; we next adjust our battery and see that the electro-magnetic mallet is in working order, and then after placing two or three small screws to hold the gold, we proceed leisurely and carefully, as we must, of course, to

hammer away at this poor dead root until we build up a beautifully formed lingual surface of gold against our porcelain front. We have here a work of art, costly, of course, as art must be, but if the patient has been a nervous one, the cost cannot be stated in sterling coin. The patient pays a part of the cost in nervous dread of the dentist's chair, perhaps, to the extent of neglecting the periodical examination that, by revealing the approach of danger, might avert it; the operator pays in the physical exhaustion that must follow a protracted operation, and when all this is done, let me ask, how much better is it for the patient than a tooth with a gold backing soldered to the pins, and to a plate covering the surface of the root, and having a wire fitting the enlarged and straightened pulp-canal in the old-fashioned way? Is it better in durability, in usefulness, in comfort, or in external appearance?

I doubt it. If some simple yet essential points in the fitting are carefully observed, thus: Let the wire be as long and as strong as the root will permit, and if it does not fit tightly rag it with a strong knife and wind it evenly and smoothly with fine floss silk until it does fit tightly. If there is not already a well-shaped cavity in the cervical end of the root, make one with an inverted cone-shaped bur. Now, warm the tooth, and place round the wire where it is soldered to the plate a sufficient quantity of rather soft gutta-percha stopping to make a perfect filling in the cavity, dry the root carefully, and put in it a little stiff sandarac varnish in such a position, that when the wire is pushed up it will carry the varnish along with it to act as a cement; then warm the tooth enough to make the gutta-percha soft, and, with a piece of wood notched at the end so as to guide the tooth as you wish, press it firmly up to its place. Any surplus gutta-percha will be pressed out and can be smoothed off with a warm burnisher. I believe a tooth fitted in this manner will last longer than one fitted in the other way, and, as will be seen, there is no part of the operation that will keep the patient in a constrained position for ten minutes at a time.

The treatment is available for any of the incisors, canines, or bicuspids, upper or lower. If one cusp only of a bicuspid is wanted, fit it so that you can fill in between the natural and artificial cusps with amalgam, finishing all down smoothly after the amalgam sets. Such operations are, it is true, more satisfactory than showy, but I doubt if we are justified in making a patient's mouth a show case for our skill, and I hope I shall never think as one of our profession may be supposed to have thought when, a few years ago, he remarked to me that, "as his patients liked to see the value of their money, he made a point of cutting away a tooth, when preparing for a filling, so as to show the gold as much as possible."

In a former paper, I alluded to the advantage of learning to operate by reflection; that is, to use the mirror in preparing and filling all approximal cavities in upper teeth, and many in the lower. A mirror with a flat, thin handle, and a ball-and-socket joint in the shank, may be so held between the second and third fingers of the left hand as to leave all the fingers at liberty to hold a napkin in position, to hold the lips back, and, if necessary, to hold a second instrument to keep a piece of gold in position while you are packing it with the right hand. You may prepare your cavities without any wedging of the teeth apart, which I believe to be both unjustifiable and cruel; you need not cut away the labial surface of a tooth, but may fill it from the back when the tooth is so much decayed that you can see the gold through the labial wall of the cavity, doing all your work with the patient sitting in a comfortable, upright position. Indeed, unless you are operating for a small child, you need never alter the position of the seat of your chair from one week's end to another, your back will not be broken by stooping, and when your work is finished there will be little if any absolutely exposed gold to be seen from the front; and what you have cut away at the back leaves the surfaces so shaped that they are easily cleaned, and, therefore, easily preserved from renewed decay.

I just alluded to the practice of wedging as cruel, and I will add to that by saying that I believe it has done nearly, if not quite, as much mischief as the indiscriminate use of arsenic to "deaden sensibility," when it was so constantly practiced thirty years ago. The teeth are wedged apart, and while they are sore and painful to touch, while, in fact, the socket is so altered in shape that concussion can be felt directly upon the apex of the root, a lot of gold is hammered into a tooth, and if the nerve is not severed where it enters the apical foramen, it is so battered and bruised that it will probably die; then, when all is done, the teeth are allowed to come back to their original position with a beautiful "contour filling" in them; and as, at the best, a filling can only make a tooth as good as it was before it decayed at all, why if we have been careful to restore the surfaces to their original shape, should they not decay again? Another objection to this method of treatment is one that all of us too frequently fail to see, and that is the suffering of the patient. How many have been driven to despair of their teeth because they literally could not bear the torture of having teeth filled in this way; and thus the effort to save has been the cause of further loss.

And this leads me to another point, and makes me wish that I had a more persuasive pen that I might induce a greater proportion of the members of our profession to think twice ere they treat all their cases alike with gold fillings. I am constantly meeting with cases

where the teeth of children and youths of both sexes are filled with gold before they are past the constitutional changes of puberty; and I think this too is both cruel and inexpedient. The mucous secretion at this time is extremely acid, as it is with child-bearing women, and as it is from many other constitutional causes at any period of life; but where it is so, where we find this secretion viscous—ropy may be a better word to describe it—we shall also find the teeth very sensitive, an unmistakable indication that decay is making rapid progress; and I do not believe that gold fillings put in at such a time will be a credit to any man, to say nothing of the increased pain to the patient. When a tooth is in this supersensitive state, the dentist has nothing like a fair chance to do thorough work; and if he does succeed in making his work satisfactory to himself, I do not believe it will be as safe or any thing like as comfortable as a gutta-percha filling would be; I think these cases should always be treated with gutta-percha until the secretions are in a normal state, and then we may be able to do gold work with some credit to ourselves and satisfaction to our patients; for the temporary stopping having checked the ravages of decay will have consequently reduced the sensibility so much that the operation will be bearable.

No one will deny, I think, that gutta-percha makes a good and durable filling where it is not exposed to much wear. If this is the case, why not protect it so that it will do in a grinding-surface cavity? It is easy to do this. We can swage a piece of thin gold plate so that it will correspond somewhat to the shape of the grinding surface of a molar tooth, cut it slightly smaller than the cavity, solder a loop or stud to the inner surface of the plate, then fill the cavity with gutta-percha, and warming the plate, press it into the filling until we get it in the right position, and we will have all the advantage of a gutta-percha filling with a surface that will not wear out. These plates can be made by the quantity, and of all sizes, so as not to take much of the operator's time in fitting, and anyone can see what I know from practical experience, that most excellent fillings, in every respect that makes a filling desirable, can be made in this way.

There is another use of gutta-percha to which I wish to call attention, although it has recently been mentioned by others, and that is as a lining for the cervical walls of cavities, more especially such as extend beyond the margin of the gum. Whether the filling is to be of gold or of any of the plastic preparations, it is an excellent precaution to lay a foundation of gutta-percha.

Dr. Kingsley, to whom we are indebted for one of the most valuable contributions our literature has ever received, has recently suggested to the society the use of amalgam for lining the cervical margins of such cavities as I have just described. I may say that I tried

this some years ago, and although I think it is better than filling such cavities entirely with gold, I do not think it is as good as gutta-percha for this purpose.

Sometimes, with all our care, a gold filling in a lower back tooth, or even a large approximal filling in an upper molar will get wet just as we are completing it. Is our labor to be thrown away in such a case? I say no. A small globule of mercury taken up on a gold-foil cylinder and applied to the surface, packed down first with a serrated plugger, and then with a burnisher, will so amalgamate all the particles of wetted gold that the surface of that filling will be as hard as it could be made if kept perfectly dry.

Of course, the usefulness of the filling depends on how it is packed in the earlier stages of the work, and only the surface of the filling is discolored with the mercury.

With gutta-percha and amalgam, we may often build up a useful crown upon the otherwise useless roots of a broken-down molar, which it might take hours of hard labor to build up with gold. I will endeavor, as concisely as possible, to explain my method of doing this. Supposing the roots to be in a healthy condition, we will insert short pieces of wire loosely in the pulp-canals of two of the roots, with the ends projecting; then take a good impression of the root, the wires coming away with the impression; if there are fragments of the crown remaining, so much the better, as they will be serviceable. When the plaster cast is made, we ought to be able to see the exact position and judge of the direction of the canals, and into each of the two we drill a small hole about a tenth of an inch deep, the holes being naturally a little divergent. We will now make a ring of thin gold plate, shaping it, if one likes to take the trouble, to the form of the tooth we are replacing, but fitting it outside any remaining fragments of the crown; then to the inside of this ring we solder two strips of gold plate, with the ends bent at such an angle and of such length that they will cover the holes in the roots; drill these at points corresponding to the holes, and insert pins in the right direction, so that when sprung into place, they will hold the ring in position. It is best, also, to solder two or three studs to the inside of the ring to assist in retaining the filling. We will now make such retaining-points as we can in the natural root, spring the ring into its place with the pins in the divergent canals, adjust the articulation, and then pack gutta-percha over the whole surface of the root, half filling the ring with that preparation and finishing with amalgam. I have made some very serviceable teeth in this way, and, as will be seen, nearly all the work is done in the laboratory, saving both patient and operator a great deal of time and trouble.

Fortunately for our patients as well as for ourselves, there are many

teeth that can be surely saved by gold fillings, and on these let us by all means exercise all our skill; but a dentist should first exercise the common-sense with which he is endowed, and be sure that his case is a suitable one for present treatment with gold before he wears out his own strength and his patient's endurance in trying to do a grand operation. In a word, let us avoid what seems to be a growing error among us, the idea that the making of gold fillings is the whole science of dentistry.

Discussion.

Dr. C. E. Francis. I believe Dr. Quinby to be a careful observer and a thoroughly practical man. He evidently belongs to the eclectic wing of our fraternity, and his paper makes suggestions which are worthy of consideration. Many dental as well as surgical operations are undoubtedly rendered needlessly severe, and patients are not infrequently compelled to suffer much pain that might, with proper skill and care, be spared. In our operations upon the teeth, it is well to bear in mind that our patients' heads are not made of stone or wood. We all know that many people have suffered such a degree of pain and fatigue from severe dental operations, that they dread ever afterwards a similar experience, and consequently keep away from the dentist and suffer their teeth to go to destruction. Many huge gold fillings that have cost the dentist hours of back-breaking and anxious toil, and the patient not only a commensurate or what might be deemed an "exorbitant" fee for the labor and skill required, but a severe and most fatiguing tax upon muscles and nerves from which it has required days or weeks to fully recover, have given out within a year or two from the time they were inserted. And such failures are not always the result of careless or defective operations, by any means, for some of the finest fillings ever inserted have given out. Too much strain upon a large contour filling in its after-use may cause its surrounding walls to break away; and on the principle that "like causes produce like results," caries may again attack a filled tooth at a vulnerable point, dissolve out its lime-salts, leave the filling without support and the entire crown a complete wreck. In many cases, well impacted stoppings of prepared gutta-percha will serve a better purpose than any other material in use for preserving teeth from further decay, simply from its more perfect adaptability to the calcareous walls against which it is packed. The buccal surfaces of second and third molars which are not much exposed to attrition are safest when treated in this manner, although these stoppings in time need renewing. Cappings of gold, such as Dr. Quinby refers to, often prove very useful by preventing the softer material

beneath from wearing away. The doctor also wisely suggests that rapidly decaying teeth, and the teeth of young people in particular, be temporarily filled with gutta-percha stoppings and kept in good repair until more favorable conditions appear for inserting gold fillings.

In regard to the use of a mouth mirror, its value to those who use it is simply incalculable.

As regards wedging, there is little doubt that many teeth have been seriously injured by severe wedging, and by subsequent harsh treatment while exceedingly sore to the touch. Strangulation and loss of vitality to pulps, with periodontitis and alveolar abscess, are results of such overdone operations, and who has not seen them?

Dr. Allen. I believe eclecticism is the best kind of practice for the dentist. He should be able to practice in all methods, for he has all sorts of patients and all sorts of constitutions to work upon.

Our operations all vary in some, if not in all, particulars, and we must defer many times to our patients' whims, as well as to their constitutional ability to bear the necessary operations.

There are patients, also, who are willing to bear and sometimes insist upon suffering more than we think necessary.

I had such a patient yesterday morning; her upper front teeth had all been filled nearly or quite round them near the gum; the right lateral, however, had gutta-percha in the lingual side, and the idea that it was not gold troubled her so much that she insisted I should take out the soft plug and replace it with gold. As the filling seemed good and was preserving the tooth, which seemed to be quite frail, I advised her to let it remain, but she wanted her own way, and I consented to do as she wished. On removal of the gutta-percha, I found the tooth in better condition than I expected. I filled the tooth with gold, and perhaps it is in better condition to last long than it was before; but that is a case where I would have allowed the soft filling to remain, because she is a patient who has her teeth examined frequently, and because I think there is sometimes much unnecessary pain and annoyance caused by these long gold operations.

Dr. Williams. There are several points worthy of remark in this paper. I know of a case that resulted fatally from heroic treatment. An eminent professional man, thinking that the shortness of his upper front teeth interfered with his speech, went to a neighboring dentist, who talked loudly of his ability to weld gold. The dentist was a man of no education, who had simply learned to weld gold. The patient sat from four to six hours a day for five consecutive days, having his teeth beaten with heavy mallets. At the end of the five days the patient had a stroke of paralysis. If the patient's power of will had been tempered by a little medical knowledge, or if the opera-

tor had been more intelligent, it might have been known that jarring the peripheral membranes of the brain either with one hard blow, or by continuous, almost uninterrupted irritation with lighter strokes, would amount to the same thing and produce paralysis. The patient lingered about two years and died of general paralysis.

When a pupil, I was taught to use magnifying lenses, as the watchmaker does, and I find it very convenient to have one mounted on a thimble, with two universal joints about half an inch apart. It can be held on the thumb or a finger of the left hand, with the glass over the operation. The idea, in some form, has been practiced by engravers for generations. My old preceptor used to say, "In working on small things look through a lens, as one would use a microscope for investigating minute objects."

In regard to preparatory treatment of delicate teeth, my attention was first drawn to that subject soon after I began to study. The original Hill's stopping then coming into use was said to be made with gutta-percha and plaster of paris, and in a short time it became soft on the surface; my teacher, Dr. Keep, suggested making it with gutta-percha and oxide of tin. That we used in teeth that were too useful to be thrown away, but not strong enough to be filled with gold in the old way. I found that the substance of the teeth became hardened under that temporary filling, and the idea entered my mind that a plan or system of preparatory treatment could be formed for the purpose of arresting decay and hardening the dentine, and allowing or encouraging a deposit of secondary dentine. I elaborated the idea and became well satisfied with my theory and practiced it on my own responsibility, although sometimes hearing from other operators that gold was the only thing that should be used. The oxide of tin, however, would discolor the teeth sometimes, and it occurred to me that oxide of zinc might not; that I tried and found it to work well, and have used it ever since. I had supposed that I was the first to think that a tooth could be hardened by preparatory treatment, but after a few years one or two patients came to me from the late Dr. Bemis (then retired) with large fillings of tin foil in some of their teeth. In answer to inquiry, they said he put them in with the remark that, perhaps, after a while the teeth might be filled with gold. About two years ago on meeting Dr. Bemis, I asked him if he had any reason for using tin. He replied that he had found (to use his own words) "the rust of the tin to have a hardening effect on the bone of the teeth." He had noticed it as a farmer would observe the weather, without understanding the science of it. Dr. Bemis died recently at the age of ninety-two years, at Bemis Station in the White Mountains. He was a close observer and a careful operator. I am satisfied that the oxide of tin, from oxidation of tin foil in a tooth,

also as an oxide combined with gutta-percha, has a corrective effect in certain stages of decay of the teeth, hardening the teeth more, perhaps, than oxide of zinc, though I think the latter has a somewhat similar effect.

To take the place of the hardening effect of oxide of tin, I saturate soft cavities with such applications as the different cavities seem to indicate; such as antacids, antiseptics, and sometimes astringents, etc., before sealing up the cavities, which it is very important should be *kept* under conservative influences by unstopping and resaturating and restopping them at intervals varying according to their conditions. This plan of treatment seems to me more rational and safer in its results than the immediate obtunding of sensibility, only to enable one to get a gold filling in at once, which often is like putting nature to sleep while you are choking her; it does not give her time to get the tooth in a condition to bear a solid metal filling. If you attempt to obstruct nature she will rebel, but by aiding her much good may be accomplished. I think that comprehends in the main, the proper principles of preparatory treatment of delicate teeth, and I have practiced on them for over thirty years.

I was sorry to hear the other day an assertion by a teacher in a dental school that there is no way of checking decay of a tooth in any stage but by complete excavation. He certainly should have known better.

Dr. Rich. The paper by Dr. Quinby contains many valuable suggestions and some erroneous ones. I suppose every dentist who wishes to be of the greatest possible use to his patients resorts to eclectic practice. But in cases where gold can be used to save the teeth it ought to be used in preference to any other substance. Dr. Quinby suggests some methods of using combinations of gutta-percha and gold or amalgam; I have seen some very successful and durable fillings where the substructure was constructed of gutta-percha protected from wear by a superstructure of gold or amalgam; properly prepared, gutta-percha is one of the most valuable substances that we have to aid us in preserving the teeth. As a temporary filling, and where there is great sensitiveness of the dentine, and where we have reason to suppose that a filling constructed entirely of gold, which is an active conductor of caloric, would destroy the vitality of the tooth, it becomes a very valuable adjunct.

I think Dr. Quinby is wrong in the matter of his criticisms on the contributions of dentists to the current literature of our profession. It is but natural for them to report the remarkable cases that occur in their practice; it is hardly to be supposed that they would report any but extraordinary cases. In fact, it would not be a matter of interest to the profession to have ordinary cases reported; and on

that account I differ with Dr. Quinby when he supposes that most practitioners are striving to perform all the difficult operations they can to the neglect of the more simple ones.

As regards his remarks upon the subject of working upon the teeth when they are sore and inflamed from the action of the wedge, I did not suppose that anyone would do that, and it would be hard for me to believe that any respectable dentist would do anything so improper; and if there are persons practicing our profession who are so unprincipled or ignorant as to do such things, they must be rare exceptions to the high grade of professional integrity which generally characterizes the members of our profession, at least in the United States.

The use of the mirror while working in the mouth is a most wise suggestion. I think upon the whole the paper is a valuable contribution to the literature of our profession. As regards the statements made by Dr. Quinby in relation to contour fillings, he is certainly not correct, and I do not think he understands the object of constructing contour fillings. But I like the spirit and honesty of purpose that pervades the whole paper, and the earnestness with which he urges upon the profession the adoption and practice of what he considers correct principles; in this particular it ought to be highly commended.

I should like to ask of those present who have used lenses in the mouth, what, in their opinion, is the best method of preventing the condensation of moisture upon the surfaces of lenses and mirrors, when they are being used, that is better than the well-known one of warming them up to the temperature of the mouth? And while we are upon the subject of the prevention of condensation on mirrors and lenses, I will state a method I adopt when I wish to examine the teeth critically. I apply the rubber dam to the teeth I wish to examine, and make them perfectly dry; the result is very satisfactory. As nobody suggests anything better than warming the mirror or lens, I will state if a film of pure glycerin is spread over the surface of the mirror, the moisture will not condense upon it.

Dr. Dwinelle. I have magnifying mirrors and lenses upon my table constantly, which I use more or less in performing delicate and difficult operations. I have no trouble in regard to moisture gathering upon the mirror or lens, for I always have a lighted lamp on my table, and it is quite sufficient to brush the mirror across that once or twice, being careful not to make it too hot so as to destroy it by volatilizing the mercury on its back. Sometimes operators dip their mirrors in hot water to prevent the condensation of moisture upon them; this, too, has to be carefully done, or the water will penetrate and impair the backing of the mirror.

By the way, speaking of dental mirrors, I do not know that it is known to the profession generally — we like to get credit for everything that belongs to us—that the entire system of mirrors, concave and plain, as adopted by the laryngoscopists, was derived from our profession. They saw their uses in our profession and wisely adopted them in their own. I have often heard them say that for this they owed us a debt they never could pay.

Dr. Ch. Fauvel, a distinguished laryngoscopist, of Paris, was one who cheerfully acknowledged his obligations to our profession for the mirrors so indispensable to his own. He once invited me to witness the operation of removing two tumors from the vocal chords; truly a beautiful operation, one requiring the highest degree of skill, dexterity, and steadiness of nerve. For weeks previous to the operation he had his patient come to him daily, to have him manipulate his throat with instruments in imitation of the operation to be performed, to familiarize the velum, throat, and vocal chords with contact with foreign substances, so as to prevent the disposition to gag, thus closing the avenue to the point of attack. This was kept up until all of the parts could be freely manipulated without causing the slightest irritation or contraction of the tissues involved.

A ball of intense light from a gas-burner was thrown into the mouth, and thence was reflected down the throat by mirrors corresponding with those familiar with us, while at the same time they brought the tumors on the vocal chords in complete view. With long, delicate, curved, cutting forceps, skillfully directed, they were entirely and successfully removed. This operation could not have been performed but for our mirrors.

I made up my mind then and there that I never would shrink from any dental operation after that. No matter how obscure the cavity, how far remote within the mouth, no matter how deeply it was seated, or how difficult it was to approach, or what time or patience it might require, I would remember Fauvel, and use the mirrors as he used them, and exercise the patience, faith, expectation, and skill, if possible, that he did. If he could go down into a man's throat almost to the bifurcation of the bronchial tubes, and successfully operate with intelligence, perception, and precision, I never would shrink from any thing that presented itself to me in my profession. I think the inspiration he gave me has been of great importance in stimulating me to perform operations that I never expected to perform, and to succeed when success seemed almost impossible.

Dr. Williams. Slightly concave mirrors should be in general use. There is a little delicacy in using a mirror by some who imagine it will be thought they need some assistance for their eyes. That is a false idea, for the patient should be instructed that fine things should

be looked at through a lens. Most of the mirrors have two short a focus. They are too concave.

Dr. Lord. In regard to keeping the mirror or lens in a condition that it will not be blurred by the breath, I keep them in my pocket, either vest or pants. The warmth of the body is quite sufficient.

Dr. Brockway. I have heard of an unique way of warming a mouth mirror practiced by a gentleman of our profession. He places it on his own tongue. I remember seeing the method of holding a magnifying glass practiced by Dr. Flagg, which was a little peculiar. He holds his magnifier in his mouth by means of a suitably bent handle. He has become so familiar with its use as to use it with great dexterity and advantage, I suppose. I noticed in Dr. Quinby's paper one passage that seems to me deserving of a little attention, and, if I understand it rightly, of adverse criticism, though in the main I am very much pleased with his paper.

It seems to me Dr. Quinby quite misapprehends the purposes of wedging teeth. In most cases it is for the purpose of getting sufficient room to make a contour filling. If I understand the object of a contour filling it is that when a tooth comes back, the original conditions are not restored, but are quite changed. If the original condition, as well as the original shape, were restored, of course our operations would have very little purpose or value. But if the conditions are changed as they must be by restoring the contour with imperishable material, then it seems to me we are justified in a proper amount ot wedging in order to secure those improved conditions.

Dr. Rich. Dr. Quinby is undoubtedly mistaken, for the original conditions are not restored. The whole object is to produce the most favorable condition of the tooth, not only for its preservation, but for the comfort of the patient, and of course where two gold surfaces are brought in contact, there is no possibility of the conditions being the same as they were before the parts were affected by caries. It would appear from the remarks that are made by Dr. Quinby on this subject, that he does not understand what the contour fillings are constructed for.

While I am up, let me say I had a case in my practice to-day that is a good illustration of the advantages of my mode of using nitrous oxide when working upon sensitive dentine. The patient was a lady of very decided will, and altogether a very irritable and disagreeable person to deal with when anything goes wrong with her, and to-day things did go wrong, for she came to me to have a tooth filled, and it proved to be very sensitive. At the first indication of pain she stopped me and she would not have anything more done to it if it was going to hurt in that way. I then proposed to use some nitrous oxide; she consented, and in doing so declared

she would not suffer pain, but would rather loose the tooth; but if I could fill it without her being obliged to suffer as she had done, she did not care what I used. I gave her some nitrous oxide, and the cavity was excavated without any trouble, and she did not make the least movement while I was doing it, but when I had finished forming the cavity and told her so, she remarked in reply, "Well, that is what I call fun!"

The President. How much did you give her?

Dr. Rich. I only filled the bag once, and it holds about four gallons. The cavity was a large one in the distal surface of the right superior second bicuspid, extending under the gum. She took three inhalations the first time, which took all the pain away; when the pain returned she took two more inhalations, and I was able to cut away the bone as rapidly as I wished. When I was about half done she asked for more and I gave her the second dose, and before I completed the excavating, I gave her two doses more of two inhalations each. It is not necessary to make the patient unconscious. This is one of the cases that are occurring in my practice all the time, and to my patients they are very satisfactory experiences. The gas is inhaled through the mouth; I apply the rubber dam before I give the nitrous oxide, and I can always arrange it so that it will not be in the way. While I am speaking I will mention a device for preventing the water from flying out of the mouth when the cavity is being syringed out. It may not be new to those present, but I mention it because, although, I have used it many years, it was new to one of my dental friends the other day, and he is not at all a young practitioner. Introduce the point of the syringe tube into or as near the cavity as possible, then direct the patient to close the lips tightly around the tube, and the water may be injected with as much force as you chose to employ, and not a drop will fly out of the mouth.

The President. I am sure you will appreciate Dr. Rich's idea of having the lips closed in using the syringe. Many a silk dress, delicate lace, etc., has been injured by the overflowing of the mouth from the hasty or copious injection from the syringe.

Dr. Lord. I generally find Dr. Rich correct, but I cannot appreciate the necessity of the patient closing the mouth when the syringe is used. I always use mouth napkins over the lips and at the corners of the mouth when operating, and even when examining the teeth, and when I use the syringe I keep the napkin to the lower lip, and with my fingers raise the lips somewhat, so that the water does not overflow.

In this way the mouth is kept open so that we can see just what we are doing. I consider the syringe one most important and useful appliance of the more modern times. I use it not only to wash out

cavities, but for washing between the teeth and for the mouth generally, rather than have patients take water from a glass. Of course for the greatest comfort the water should be tepid, and it is very easy to keep it so for constant use.

Adjourned.

CENTRAL DENTAL ASSOCIATION OF NORTHERN NEW JERSEY.

The third annual meeting of the Central Dental Association of Northern New Jersey was held at Elizabeth, N. J., February 23, 1882. The following officers were elected for the ensuing year:

J. A. Osmun, president; S. C. G. Watkins, vice-president; G. Carleton Brown, secretary; C. A. Meeker, treasurer; H. A. Hull, F. C. Barlow, W. Price Richards, L. S. Marsh, J. C. Hanks, executive committee.

G. Carleton Brown, *Secretary*, Elizabeth.

ALUMNI ASSOCIATION OF THE BOSTON DENTAL COLLEGE.

At the eleventh annual meeting of the Alumni Association of the Boston Dental College, held in the college building, March 1, 1882, the following officers were elected for the ensuing year:

Dr. Leon Rideout, president; Dr. H. A. Baker, first vice-president; Dr. N. N. Noyes, second vice-president; Dr. Edgar O. Kinsman, secretary; Dr. George C. Ainsworth, treasurer; Drs. J. B. Coolidge, L. B. Fenderson, and R. R. Andrews, executive committee.

Edgar O. Kinsman, *Secretary*,
Cambridge, Mass.

ALABAMA DENTAL ASSOCIATION.

The regular annual meeting of the Alabama Dental Association will be held in Montgomery, Alabama, commencing Tuesday, April 11, 1882, and continuing four days.

The State Board of Dental Examiners will meet at the same time and place. All dentists practicing in the State are required by law to procure a license from the board. Applicants will report promptly on the first day of the session.

T. M. Allen, *Secretary*, Eufaula.

TEXAS STATE DENTAL ASSOCIATION.

The annual meeting of the Texas State Dental Association will be held in Waco, Texas, on Wednesday, May 3, 1882.

W. R. Clifton, *Cor. Sec.*, Waco.

KANSAS STATE DENTAL ASSOCIATION.

The eleventh annual meeting of the Kansas State Dental Association will be held in Topeka, Kansas, commencing Tuesday, May 2, 1882. Members of the profession throughout Kansas and adjoining States are urgently requested to attend. The usual reduction in hotel rates and railroad fares will be secured.

J. D. Patterson, *Secretary*, Lawrence.

GEORGIA STATE DENTAL SOCIETY.

The regular annual meeting of the Georgia State Dental Society and the State Dental Examining Board will be held in Macon, Ga., May 10, 1882, continuing four days.

L. D. Carpenter, *Cor. Sec.*, Atlanta.

BALTIMORE COLLEGE OF DENTAL SURGERY.

The forty-second annual commencement of the Baltimore College of Dental Surgery took place at Ford's Opera House, Baltimore, Md., on Thursday, March 9, 1882, at 2 p.m.

The annual oration was delivered by Professor Richard F. Gundry, M.D.; the class valedictory by John S. Bizzell, D.D.S.

The number of matriculates for the session was ninety-three.

The degree of D.D.S. was conferred on the following members of the graduating class by Professor F. J. S. Gorgas, Dean of the Faculty:

NAME.	RESIDENCE.
Henry S. Abendschein	Maryland.
Charles L. Alexander	North Carolina.
Pedro A. Arcentales	South Carolina.
Julius A. Ballentine	North Carolina.
John S. Bizzell	North Carolina.
Gordon H. Claude	Maryland.
W. Connor Cleckley	South Carolina.
Genaro W. Cooke	South America.
Charles W. Daly	B. West Indies.
Amos C. Daniels	Pennsylvania.
Willie F. Davison	Virginia.
William H. DeFord	Dist. Columbia.
Charles F. Dinger	Maryland.
Louis P. Dotterer	South Carolina.
Thomas S. Eader	Maryland.
Wallace W. Freeman	Maryland.
Ferdinand S. Gorgas	Pennsylvania.
G. Ashman Hamill	West Virginia.
Irby Hardy	Virginia.
Lewis J. Harmanson	Virginia.
William Hepburn, Jr.	New York.
George W. Hunt	Pennsylvania.
Philip F. Laugenour	North Carolina.
Archie McAlpine	Pennsylvania.
James P. McDonald	Mississippi.
John Miller	New York.
George E. Morrow	Maryland.
Steuart B. Muncaster	Dist. Columbia.
Gustavus North	Iowa.
George A. Patrick	Georgia.
Hugh Pirkey	Virginia.
W. Chalmers Ralston	Pennsylvania.
B. Taylor Read	New York.
Norman J. Roberts	Illinois.
Jose J. Sanjurjo	West Indies.
Samuel P. Sharp	Tennessee.
James E. Shields	North Carolina.
Charles A. Slocum	New York.
Henderson Snell	North Carolina.
Mordecai G. Sykes	Maryland.
George G. Taylor	Virginia.
Lewellen C. Tucker	Virginia.
T. John Welch	Virginia.
B. H. Whittington	Maryland.
Robt. C. Williams, M.D.	South Carolina.
John M. Wilson	Pennsylvania.
Cincero R. Yearick	Ohio.

OHIO COLLEGE OF DENTAL SURGERY.

The thirty-sixth annual commencement of the Ohio College of Dental Surgery was held in College Hall, Cincinnati, Ohio, on Tuesday evening, February 28, 1882.

The annual address was delivered by C. M. Wright, D.D.S., and the class oration by Robert Goebel, D.D.S.

The number of matriculates for the session was sixty-eight.

The degree of D.D.S. was conferred on the following graduates by James Leslie, D.D.S., President of the Board of Trustees:

NAME.	RESIDENCE.
Edwin L. Ashton	Michigan.
Harry F. Anshutz	Ohio.
Clarence W. Bard	Pennsylvania.
Alexis Bertrand	France.
Chas. F. Braffett	Ohio.
Wm. A. Bettman	Ohio.
A. F. Bowman	Ohio.
Edward E. Ball	Ohio.
J. E. Barriklow	Ohio.
C. G. Burgin	Kentucky.
James W. Dennis	Ohio.
Charles N. Dann	Ohio.
Charles Dappen	Germany.
George W. Dengler	Kentucky.
C. L. Franks	Ohio.
Robert Goebel	Illinois.
Wm. D. Green	Illinois.
Christian A. Herr	Ohio.
Charles G. Junkermann	Ohio.
Cyrus T. King	Ohio.
W. C. Kerns	Ohio.
J. Walter Mann	Illinois.
J. H. Maust	Pennsylvania.
J. S. Mardis	Pennsylvania.
Chas. S. Ogborne	Indiana.
Jas. S. Perkins	Wisconsin.
Legrand B. Perry	Indiana.
Al. O. Ross	Ohio.
Frank D. Rice	Kentucky.
W. H. Smith	Ohio.
William H. Todd	Ohio.
Townsend J. Thomas	Iowa.
Wm. M. Williams	Ohio.
Forest O. Welker	Colorado.
Wesley L. Williams	Michigan.

PENNSYLVANIA COLLEGE OF DENTAL SURGERY.

The twenty-sixth annual commencement of the Pennsylvania College of Dental Surgery was held at the American Academy of Music, Philadelphia, Saturday, February 25, 1882, at 12 o'clock M.

The valedictory address was delivered by M. H. Fetzer, D.D.S.; the address to the graduates by Professor W. F. Litch.

The number of matriculates for the session was one hundred and twenty-five.

The degree of D.D.S. was conferred on the following graduates by Professor S. D. Gross, President of the Board of Trustees:

NAME.	RESIDENCE.
Don A. Allen	Ohio.
M. E. Andrews	Pennsylvania.
Thos. S. Atkinson	Pennsylvania.
C. W. Barber	Pennsylvania.
Paul Bayerle	Germany.
G. A. Bianchi	Italy.
O. C. Bogardus	New Jersey.
N. E. Bowman	Pennsylvania.
Geo. H. Butler	New York.
W. P. Caldwell	Ohio.
John Carter	Connecticut.
Alfred D. Clark	Pennsylvania.
John M. Cooper	Pennsylvania.
C. B. Cowan	South Carolina.
L. H. De Lange	Pennsylvania.
Chas. A. Dougherty	Ohio.
J. P. Eldridge	Pennsylvania.
M. H. Fetzer	Pennsylvania.
O. H. Franklin	Pennsylvania.
D. L. German	Pennsylvania.
Adolph Gerstel	Germany.
Chas. L. Gibbs	Pennsylvania.

NAME.	RESIDENCE.
James Granger	New York.
L. J. Graves	New York.
Charles Harker	New Jersey.
E. W. Harris	New York.
Alwin Hennet	Germany.
D. Rhine Hertz	Pennsylvania.
Jasper N. Jones	Florida.
Emil Krüger	Germany.
L. H. Leitzell	Pennsylvania.
J. A. Libbey	Ohio.
F. D. Mann	Illinois.
F. Mannhardt	Germany.
Julius Neumunz	Switzerland.
E. Everett Park	Kentucky.
Harold S. Patterson	Minnesota.
D. T. Pepper	Pennsylvania.
C. H. Peter	Pennsylvania.
H. K. Edw'd Poessel	Illinois.
Chas. J. Rathbun	Pennsylvania.
W. L. Reed	Missouri.
L. Restrepo	U. S. of Colombia.
A. J. Sawyer	Pennsylvania.
Max J. Sternberg	Germany.
W. H. Stryker	Pennsylvania.
J. C. Townsend	Delaware.
M. T. Vogle	Pennsylvania.
S. P. Waugaman	Pennsylvania.
T. R. Whiting	New York.

PHILADELPHIA DENTAL COLLEGE.

The nineteenth annual commencement of the Philadelphia Dental College was held at the American Academy of Music, Philadelphia, Wednesday, March 1, 1882, at 8 P.M.

The valedictory address was delivered by Leon F. Head, D.D.S.; the address to the graduates by Prof. J. Foster Flagg, D.D.S.

The number of matriculates for the session was one hundred and thirty-eight.

The degree of D.D.S. was conferred on the following graduates by the President of the Board of Trustees:

NAME.	RESIDENCE.
Clarence Archer	West Indies.
Thomas J. Burgess	Michigan.
Fred. W. Cryderman	Ontario.
Bernard Chedel	Georgia.
C. Byron Crandall	New York.
James R. Dickson	Canada.
Walter A. Dorland	Canada.
George C. Duncan	New York.
F. M. Edwards	New York.
Charles E. Faxon	Rhode Island.
Otto Fenthol	Germany.
Samuel J. Fisher	New York.
George A. Fowler	Pennsylvania.
Ernest W. Fox	England.
J. S. Garner	South Carolina.
C. H. Guthapfel	Pennsylvania.
William L. Haskell	Maine.
A. B. Harrower	Rhode Island.
J. A. Hartman	Pennsylvania.
Leon F. Head	Pennsylvania.
Alfred Healey	New Jersey.
G. H. F. Herbst	Germany.
W. Hirschfeld	Germany.
Thomas H. Holland	Pennsylvania.
C. J. O. Hotz	Switzerland.
Charles R. Jefferis	Delaware.
R. Holt Jones	Delaware.
A. T. Lamb	Maine.
A. LaRosque	Canada.
William W. Lazear	Illinois.
S. B. Luckie	Pennsylvania.
Charles E. Mason	Ohio.
F. H. McIntosh	Illinois.
C. A. Merrill	Georgia.
J. B. Miesse	Pennsylvania.
P. J. Navarro	South America.
G. C. Nixon	Ohio.
William F. Parks	Pennsylvania.
William Peper	Pennsylvania.
F. M. Poulson	Michigan.
H. C. Read	New York.
Adolf Rettich	New York.
F. M. Reynolds	Pennsylvania.
George P. Rishel	New York.
E. Rodriguez	Cuba.
A. D. Rosenthal	Pennsylvania.
John H. Sailor	Indiana.
I. W. Scarborough, Jr.	Mississippi.
B. F. Sleeper	Pennsylvania.
P. L. Stoddard	New York.
A. E. Verrinder	California.
Guy B. Vroom	Connecticut.

NEW YORK COLLEGE OF DENTISTRY.

The sixteenth annual commencement of the New York College of Dentistry was held at Chickering Hall, New York, Thursday evening, February 23, 1882.

The valedictory address was delivered by Charles E. H. Phillips, D.D.S.; the address to the graduates by Hon. Algernon S. Sullivan.

The number of matriculates for the session was one hundred and twenty-four.

The degree of D.D.S. was conferred on the following graduates by Dr. Wm. H. Allen, President of the Board of Trustees:

NAME.	RESIDENCE.
Charles P. Allen	Massachusetts.
Martin L. Ballard	Ohio.
Ruby E. Clifford	England.
Alfred Dennis	New York.
Frank S. Derby	New York.
Charles A. DuBois	Denmark.
John H. Feindel	New York.
Anthony A. Formel	Cuba.
Edward L. Fuller	Massachusetts.
Fred. W. Gillen	New York.
Martin C. Gottschaldt	Germany.
Addison H. Griffing	New York.
F. L. Hesse, M.D.	Germany.
Alex. Kronmeyer	Central America.
Eduardo Lopez	Ecuador, S. A.
Harry C. Medcraft	Connecticut.
Karl J. Milke	Germany.
William H. Mitchell	New Jersey.
Oscar L. Moser	Germany.
Archibald McFadgen	California.
Benjamin C. Nash	England.
James Neil, Jr.	New York.
Charles E. H. Phillips	Connecticut.
Willis A. Reeve	New York.
Richard Shuebruk	England.
Roswell O. Stebbins	California.
Albert A. Stillman	New York.
Augustus J. Syme	Connecticut.
Frederick J. Wells	New Jersey.
John C. Westervelt	New Jersey.

MISSOURI DENTAL COLLEGE.

The sixteenth annual commencement exercises of the Missouri Dental College took place, in connection with those of the St. Louis Medical College, at Mercantile Library Hall, St. Louis, on Wednesday, March 8, 1882, at 7½ o'clock P.M.

The address to the graduates was delivered by Professor H. H. Mudd, M.D.; the valedictory address by Professor E. F. Smith, M.D.

The number of matriculates for the session was sixteen.

The degree of D.D.S. was conferred on the following members of the graduating class by Professor H. H. Mudd, Dean of the Faculty:

NAME.	RESIDENCE.
Charles M. Bremermann	Missouri.
Ellis W. Bliss	Missouri.
George M. Cameron	Illinois.
Thomas L. Gilmer	Illinois.
Stephen D. McCallum	Canada.
Milton E. Taber	Minnesota.

BOSTON DENTAL COLLEGE.

The fourteenth annual commencement of the Boston Dental College was held at Memorial Hall, Boston, on Wednesday evening, March 1, 1882.

The address to the graduates was delivered by Rev. M. J. Savage; and the valedictory address by Homer Emerson, D.D.S.

The number of matriculates for the session was fifty.

The degree of D.D.S. was conferred on the following graduates by the President of the College, Professor Isaac J. Wetherbee:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
Rufus Oscar Clark	Massachusetts.	William Osceola Gray	Massachusetts.
Frank Arthur Damon	Massachusetts.	Charles W. Ham	New Hampshire.
Harry Neal Day	Massachusetts.	Newell D. Johnson	Massachusetts.
Homer Emerson	Massachusetts.	John Francis Lennon	Massachusetts.
Edwin Chas. Frizzell	Vermont.	George Otis Mitchell	Maine.
Charles Sumner Gates	Massachusetts.	Asa Stevens Nutter	Canada.
Edw'd Payson George	New Hampshire.	Walt. Leonard Stevens	Massachusetts.
Wm. Franklin Gilman	Massachusetts.	Byron Howard Strout	Alabama.
Alfred Henry Gilson	Massachusetts.	Theron W. Temple	Massachusetts.
Augustus L. Wells, Jr.	Rhode Island.		

WESTERN COLLEGE OF DENTAL SURGEONS.

The annual commencement exercises of the Western College of Dental Surgeons took place, in connection with those of the Medical College, at Pickwick Hall, St. Louis, March 2, 1882, at 8 o'clock P.M.

The number of matriculates for the session was six.

The degree of D.D.S. was conferred on the following graduates:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
Wordamon B. Courtney	South Carolina.	Julia C. Mann	Illinois.
Louise E. Ottofy	Missouri.		

UNIVERSITY OF PENNSYLVANIA—DENTAL DEPARTMENT.

The annual commencement of the University of Pennsylvania, including the Department of Dentistry (third commencement), was held at the American Academy of Music, Philadelphia, on Wednesday, March 15, 1882, at 12 o'clock.

The annual address was delivered by Professor James Tyson, M.D.

The number of matriculates for the session was eighty-eight.

The degree of D.D.S. was conferred on the following members of the dental class by William Pepper, M.D., Provost of the University:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
James H. Abrams	Pennsylvania.	John H. Laney	Missouri.
Edward H. Allen	Illinois.	Martin H. Musser	Pennsylvania.
Philip Betts	England.	A. W. McCandless	Iowa.
Allen E. Bradley	New York.	Harry B. McFadden	Pennsylvania.
Albert J. Bushong	Pennsylvania.	Charles R. McFarlan	Pennsylvania.
Chas. O. de Causse, M.D.	Cuba.	Frank H. McIntire	Massachusetts.
Alfred E. Correvan	Switzerland.	William McNair	Pennsylvania.
Alfredo Cristy	Porto Rico.	Leoncio B. Nunez	Cuba.
Theodore E. Devereux	Wisconsin.	Gabriel Oltramare	Switzerland.
Raphael A. C. Dillon	Brazil.	Charles J. Peters, Jr.	New York.
J. Judson Edwards	Pennsylvania.	Manuel G. Ramos	Ecuador.
Adriel B. Ely	New York.	Godfrey S. Salomon	Wisconsin.
Francisco Escobar	U. S. of Col.	William H. Shannon	Pennsylvania.
J. A. Fothergill, L.D.S. (M.R.C.S)	England.	John G. Sharpe	New York.
Solomon Freeman	Pennsylvania.	H. L. Smedley (Ph. G.)	Pennsylvania.
William E. Gerrish	Indiana.	Charles M. Stetson	Buenos Ayres.
Emil Haberstich	Switzerland.	Eugene Sunderland	Illinois.
George L. Hurd	Massachusetts.	John W. Tudor	Pennsylvania.
Henry H. Keim	Pennsylvania.	Albert G. Weed, Jr.	Connecticut.
Charles F. Kelly	Pennsylvania.	William T. White	New Jersey.
		Jefferson P. Winner	Delaware.

DENTAL DEPARTMENT OF THE UNIVERSITY OF TENNESSEE.

The fourth annual commencement exercises of the Dental Department of the University of Tennessee took place, in connection with those of the Medical Department, in the Grand Opera House, Nashville, February 23, 1882.

The valedictory address was delivered by Dr. T. S. R. Ward; the salutatory by W. W. Grant, D.D.S.; and the charge to the classes in dentistry and medicine by Professor T. O. Summers.

The number of matriculates for the session was thirty-two.

The degree of D.D.S. was conferred on the following members of the graduating class:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
C. B. Johnson	Mississippi.	A. E. McGlothlin	Tennessee.
W. W. Grant	Tennessee.	J. R. George	Texas.
N. M. Culbreth	North Carolina.	S. S. Shackleford	Texas.
John N. Griner	Tennessee.	P. D. Houston	Tennessee.
J. N. Greer	Georgia.	Chas. E. Hawley	Louisiana.
W. N. Leseur	Tennessee.	J. C. Grant	Tennessee.
John T. Ryan	Tennessee.	W. H. Cooke	Texas.

INDIANA DENTAL COLLEGE.

The third annual commencement of the Indiana Dental College was held in the College Hall, Indianapolis, on Tuesday evening, February 28, 1882.

The valedictory address was delivered by F. M. Harris, D.D.S.; the address to the graduates by S. B. Brown, D.D.S.

The number of matriculates for the session was twenty-eight.

The degree of D.D.S. was conferred on the following graduates:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
J. E. Bodine	Ohio.	J. L. Mahan	Ohio.
F. W. Blomily	Wisconsin.	D. G. Parker	Louisiana.
F. M. Harris	Indiana.	W. M. Ramsdell	New York.
L. L. Hinshaw	Indiana.	F. Sawhill	Nebraska.
R. E. Henshie	Illinois.	E. W. Sheriff	Colorado.
W. F. Kennedy	Indiana.	D. R. Smith	Illinois.
C. A. Murray	Ohio.	W. W. Shryock	Indiana.
T. R. Woodard	Indiana.		

DENTAL DEPARTMENT OF VANDERBILT UNIVERSITY.

The third annual commencement of the Dental Department of Vanderbilt University was held in the chapel of the University, Nashville, Tenn., on Thursday evening, February 23, 1882.

The valedictory address was delivered by Marques J. Lunquest, D.D.S.; and the address to the graduates by Professor R. R. Freeman.

The number of matriculates for the session was thirty-three.

The degree of D. D. S. was conferred on the following graduates by Dr. Garland, Chancellor of the University:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
Thomas M. Allen	Alabama.	Thomas H. Lipscourt	Tennessee.
James A. Barr	Kentucky.	Marques J. Lunquest	Alabama.
William J. Flanders	Georgia.	John H. Magruder	Louisiana.
William A. Flemister	Georgia.	Francis H. McAnnally	Alabama.
James W. Hambright	Georgia.	John M. Powell	Texas.
Stephen R. Jordan	Georgia.	David R. Stubblefield, M.D.	Tennessee.
William W. Kemper, M.D.	Missouri.	William J. Tillett	Tennessee.

ROYAL COLLEGE OF DENTAL SURGEONS OF ONTARIO.

The fourteenth annual examination of the Royal College of Dental Surgeons of Ontario, Canada, held in the city of Toronto, was completed on March 10, 1882.

Students in attendance on lectures, thirty-four.

No formal commencement is held.

The following gentlemen received license to practice dentistry in Ontario and the title of L.D.S. (Licentiate of Dental Surgery), viz.:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
Fred. J. Brown	Port Hope.	C. A. McNairn	Hamilton.
S. S. Davidson	Ottawa.	A. J. Robertson	Norwood.
Alex. A. Graham	Ottawa.	G. A. Richardson	Aylmer.
John D. Hamell	Aurora.	J. C. Stewart	Brockville.
M. S. Henry	Newcastle.	F. J. Stowe	Toronto.
Chas. S. Knight	Brantford.	C. H. Riggs	Toronto.
J. A. Liddell	Cornwall.	J. J. Teetzel	St. Thomas.
A. C. McKinlay	Georgetown.	J. A. Smith	Ingersoll.
Duncan McFarlane	Brampton.	John Wells	Toronto.
O. H. Zeigler	Berlin.		

BIBLIOGRAPHICAL.

A Manual of Dental Anatomy, Human and Comparative. By Charles S. Tomes, M.A., F.R.S. With 191 illustrations. Second edition. Philadelphia: Presley Blakiston, Son & Co., 1882. Price, $4.25.

The first edition of this book, published in 1876, was noticed at length in the Dental Cosmos for January, 1877. Of the new edition the author says, "It has been entirely revised; some portions, notably the chapter on the dental tissues, have been in great part rewritten, and many new illustrations have been added here and elsewhere in the book."

No other such complete and admirable *résume* of the subject-matter of this book is to be found, and we cannot do better than to quote, with added emphasis, the concluding paragraph of the notice previously alluded to of the first edition.

"The author has evidently made this book a labor of love. Every page shows conscientious work,—no slovenliness or haste being anywhere apparent. The knowledge of his subject is comprehensive, and he has used it to advantage. The wood-cuts are numerous, excellent, and, with a comparatively few unimportant exceptions, are original, having been specially executed from original drawings and specimens."

This volume should find place in the library of every dentist interested in the histology of the teeth.

VACCINATION: Arguments *Pro* and *Con*, with a Chapter on the Hygiene of Small-pox. By JOSEPH F. EDWARDS, M.D. Philadelphia: P. Blakiston, Son & Co., 1882. Price, 50 cents.

In eighty pages the author has discussed vaccination, what it is, what it does, the arguments in its favor, the arguments in opposition, how to vaccinate, and the hygiene of small-pox. The book fulfills very satisfactorily the intent of the writer to convince the lay public that in vaccination, properly performed, is alone to be found immunity from the ravages of small-pox.

THE STUDY OF TRANCE, MUSCLE-READING, AND ALLIED NERVOUS PHENOMENA IN EUROPE AND AMERICA, with a Letter on the Moral Character of Trance Subjects, and a Defense of Dr. Charcot. By GEORGE M. BEARD, A.M., M.D. New York, 1882.

This is a flexible cloth-covered pamphlet of forty pages, giving narratives and analyses of facts relating to the interesting phenomena of the nervous system in the manifestations known as muscle-reading, mind-reading, mesmeric sleep, trance, etc.

OBITUARY.

RESOLUTIONS ON THE DEATH OF DR. JOSHUA TUCKER.

AT the monthly meeting of the American Academy of Dental Science, held in Boston, January 4, 1882, the following resolutions were unanimously adopted:

Resolved, That the American Academy of Dental Science has received with sincere sorrow the intelligence of the death of our late beloved friend and associate, Dr. Joshua Tucker, of Boston, an honorary member and former president of this society, who departed this life November 7, 1881, aged eighty-one years and three months.

Resolved, That in the decease of Dr. Tucker this Academy has been called to mourn the loss of one of its most valued members; one whose ability, integrity, genial manner, and kindness of heart endeared him to all whose privilege it was to be associated with him. By his death another distinguished name is added to the list of those early pioneers in dental science who have finished their earthly

labors and passed into the land of rest and immortality, and whose memory the profession will ever delight to honor and cherish.

Resolved, That this Academy will never forget the deep interest and untiring devotion which our late friend invariably brought to the performance of his duties during his long and successful professional life, embracing a period of more than fifty years. Dr. Tucker was one of the first in the country to take a high stand in the practice of his profession, which he always maintained; and throughout his whole career his actions were always characterized by an enlightened sense of the responsibilities which rested upon him, both in his relations with the profession and with those who were placed under his care and treatment, thus proving his constant desire to be faithful to the trust reposed in him. His patients, as well as the profession, will hold him in grateful remembrance.

Resolved, That our sympathies and condolence are extended to his widow and other relatives in their bereavement, and we would also rejoice with them that he was permitted to live to such an advanced age, and that he has left so beautiful a record of a long and useful life.

Resolved, That these resolutions be entered upon the records of the Academy, and that the Secretary be instructed to transmit a copy of the same to the widow of the deceased, also to the dental and medical journals for publication.

GEORGE T. MOFFATT,
JACOB L. WILLIAMS, } *Committee.*
EDWARD N. HARRIS,

HINTS AND QUERIES.

"He that questioneth much shall learn much."—BACON.

CORRESPONDENTS desiring a reply in this department are requested to make use of *distinctive signatures or initials*, and avoid the practice of signing their communications Reader, Subscriber, etc.

CORRESPONDENTS who wish notice to be taken of their communications should authenticate them with their names. We cannot insert queries or replies except they are so accompanied. Names not necessarily for publication.

WILL some one who has tried it report his experience in the use of permanganate of potassium as a disinfectant in cavities and nerve-canals, and its relative value to carbolic acid?—S. O'C.

IN carbolizing the carious dentine frequently left in a cavity, how long a time should the application be allowed to remain in the cavity?—CARBOLIC ACID.

IS it safe in varnishing a cavity before filling to varnish the edges of the orifice as well as the rest of the cavity?—COPAL.

CAN syrup of lacto-phosphate of lime be generally prescribed without detriment to patients? In what doses and for what length of time may it ordinarily be given?—IGNORAMUS.

HAS there ever been any decision in any of the courts of the United States in the case of a party having had an impression taken and ordering a set of teeth, and then failing to keep the contract to call for them?—S. A. J.

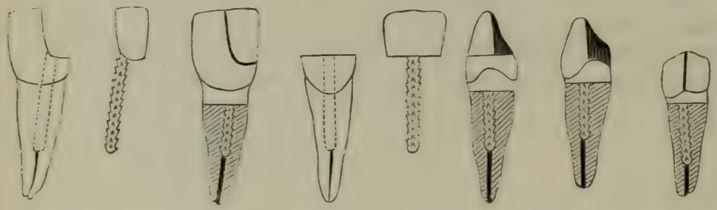
A METHOD OF RESTORING BROKEN CROWNS WITH PIECES OF ARTIFICIAL TEETH.—Having read an article in the *Dental Miscellany* of October last by Dr. E. Parmly Brown, on the contour restoration of the superior central incisors with gold, recording many failures immediately following such operations, I am induced to explain a system that I have been employing quite successfully in such

cases for four years, as also in large approximal cavities in bicuspids and molars, when the decay extends into the crown.

I have been quite an advocate for contour restoration of teeth with gold, which my dental register proves. But experience has taught me to put less confidence in such operations, and to seek for something more beautiful and more lasting.

I will, therefore, give my *modus operandi* in a few of many cases—beginning with a central incisor, with one-third of the crown broken off, as in Fig. 1. I fill the root with lead wire, as follows: From a piece of sheet-lead I cut a strip and pass it through a draw-plate until it is reduced to the size of a medium pin; cut the wire into pieces one inch long and roll one end to fit the foramen at the apex. If, in passing it up, I find that it goes through (which I ascertain from the pain produced), I take it out and cut the point off a little, and try it again. When I find that it has closed the apex exactly, which I know from the touch,

1. 2. 3. 4. 5. 6. 7 8.



I pass down by the side of it a nerve-plugger the same shape as the lead needle introduced, making room for another wire, and so on until I find the first third of the root filled. I then fill the middle part with gutta-percha, cutting the wires off as far up as I can; otherwise the lead might discolor the tooth at the margin of the gums. I then fill the last third of the root with oxyphosphate cement to prevent the tooth from turning dark. Before introducing the lead wires, I moisten them with phenic acid or creasote. Lead is less irritating in the flesh than any of the other metals. I have found buck-shot in deer that had long since healed over, with no sign of inflammation or ulcers. For the reason that flesh will kindly heal around lead, I think it the best material that can be employed for filling the roots of teeth. Next, drill a hole as if for a pivot, and shape the rough edges of the crown more or less as in Fig. 1. Select a plate tooth having pins parallel with the sides, the exact shade of the tooth to be operated upon, and grind it to fit the part to be replaced. (See Fig. 2). Back the piece of artificial tooth with a thin platinum plate, cutting the pins off smoothly with the backing, and secure it by splitting the heads of the pins. Then put the platinum wire into the hole drilled for the pivot, inserting it loosely, and bending to such a shape as to touch against the walls so that it may occupy the same position when replaced. Attach the piece of tooth to the wire (which is already in the tooth) with wax, leaving a space the thickness of a 00 file between the natural and piece of artificial tooth. Now draw the wire out very carefully, to guard against displacing the piece of tooth; invest in plaster, and solder with pure gold. Make the backing thick enough to give the necessary finish to the tooth. Next, dry the hole with hot air; put the piece of tooth in its place with enough plastic filling (either gutta-percha or oxyphosphate) around the wire to fill the interspaces; then cut out the material in the joint to the depth of two lines, fill in with gold, and finish with disks, etc. The crown is now restored (see Fig. 3)

with something that does not attract so much attention, which is more lasting, and is far more artistic, with less fatigue to patient and operator than if it had been restored with gold. Some of my work has been in use for four years, and it is as perfect as when executed.

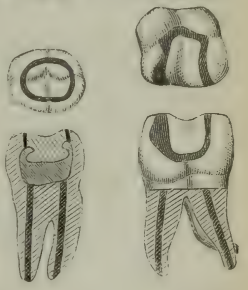
But it must be borne in mind that this method can be employed successfully only in pulpless teeth, except where the cavity has sufficient depth in vital ones to guarantee the operation.

Fig. 4 represents a central incisor having two-thirds of the crown, parallel to the cutting-edge, broken off. In a case of this kind fit a point to the crown, and proceed in the same manner as described in the preceding case. Fig. 5 shows the piece of porcelain tooth prepared, and Fig. 6 a side-view of the restored crown. All except that portion of the broken surface of the natural tooth that is not covered by the artificial piece must be covered with a thin platinum plate, with a hole through it to permit the wire to pass. This is done in order to have a wall to flow the solder against, and to make the piece the required thickness at the joint. Cases like Fig. 1 sometimes require similar treatment. When there is plenty of space on the palatal surface, retaining-pits may be made, and the shape restored by building gold against the backing of the artificial tooth. The latter requires more time, and is, perhaps, no better, if as good as the former.

Many, no doubt, would cut off the remainder of the crown in a case like that shown in Fig. 4, and pivot. But I consider tooth-structure too valuable to be thus lost, to say nothing of the difficulty of making a joint beneath the gum so perfectly as to prevent the accumulation of vitiated secretions around it. I, therefore, save all I can, not being particular where the joint is made. Another advantage in having the joint at a distance from the gum is, that the root is less liable to decay. Still, even when the crown is entirely lost (See Figs. 7 and 8), I find the above method a good one for pivoting, using gutta-percha to secure the tooth in position, and to prevent the secretions from entering the joints, trimming smoothly the excess of gutta-percha around the joint.

Bicuspids and molars (see Figs. 9 and 10), having very large buccal or approximal cavities extending into the grinding surface, can be easily managed by fitting pieces of artificial teeth into cavities. If the teeth are dead the pieces may be more perfectly secured by soldering a wire and extending it down the root. In operating on a superior molar, use a long wire for the palatal root, and a shorter one may be placed on the opposite side as a brace. Excavate the material as described, and fill around with gold. No more space is required. The expansion and pressure being much less in these operations, they will be found to last longer than if restored with gold.—S. D. Rambo, D.D.S., *Rio de Janeiro, Brazil.*

Fig. 9. Fig. 10.



Root-Filling and Nerve-Capping.—In the report of a clinical service by Dr. Cryer, at the Philadelphia Dental College, published in the January number of the Dental Cosmos, I notice what seem to me some grave errors in the teaching, which I take the liberty to note. In the first place Dr. Cryer instructs that, after thoroughly cleansing and disinfecting root-canals, they should be filled solidly with carbolized cotton, which may be allowed to remain for a permanent filling. What is the object of root-filling? What material have we at command that most thoroughly and satisfactorily accomplishes that purpose? The

principal object in filling roots is to prevent them from being receptacles of foul gases, which are sure to form there—the result of decomposing animal matter—which, forcing their way through the apical foramen, irritate the surrounding tissues, and cause periostitis or alveolar abscess. We need, therefore, a material which will adapt itself to the walls of the canals, and which has an antiseptic and disinfectant influence. Cotton, carbolized or not, on account of its great porosity, though packed as solidly as may be, can not be adapted perfectly to the walls of the canals; but it is claimed that being carbolized it will prevent the formation of gases. True, it does answer that purpose very well, so long as it remains carbolized; but, little by little, the acid with which it is saturated finds its way out of the canal, leaving nothing but the cotton, which simply acts as a sponge in absorbing and retaining all the effete matter formed within the canals. The consequence is, that in the course of time, an abscess will be formed at the root. It may be in a few months, or not for five or six years, but it is only a question of time. The work of cleansing, treating, and refilling must sooner or later be done over again. For good, permanent root-filling it would seem that no material with which we are acquainted gives such satisfactory results as the oxychloride of zinc. It acts mechanically, if properly inserted, by thoroughly adapting itself to every crevice in the canals, a very important requisite; for, cleanse the cavities as thoroughly as we may, animal matter will still remain in them. If nowhere else, it will be found at or near the apical foramen where the vessels have been severed from their main branches. Then, too, there is in all the dental tubuli organic matter which for a long period after the death and removal of the pulp is undergoing decomposition, and sulphureted hydrogen gas is constantly being generated and poured into the pulp-canal. Now, it must be met at every point by an enemy, or hazardous results will follow. Here again oxychloride answers an admirable purpose. Having very strong antiseptic and disinfectant qualities, it first prevents the formation of gas in the canals, and then changes the character of that which may be generated in the tubuli. Such a filling will not have to be removed in a few months or years, but will last as long as the tooth does, always giving satisfaction to the patient and doing credit to the operator.

Dr. Cryer advises nerve-capping with this same oxychloride of zinc; but, although it answers an admirable purpose for root-filling, yet for nerve-capping it is one of the *worst* preparations that can be used. We believe that more nerves have been devitalized under this application than from any other cause. The doctor says that it may devitalize the pulp, but if so it will mummify it, so that probably no pain will be felt. In these days we consider it of the very greatest importance to keep the pulp alive, the reasons for which are apparent. We cannot even hope for satisfactory results if we use this powerful irritant. If applied we are almost sure to have irritation of the pulp, followed by inflammation, suppuration, and the devitalization of that organ. These are not all of the evils resulting from the use of oxychloride of zinc, for many times patients are made to bear the most excruciating pain from its application. So long as we have other preparations so well adapted to our purpose, why not use them and avoid the risk. Oxyphosphate of zinc is one of the best of cappings for an exposed pulp. It is much less irritating than the chloride, is stimulating, and has antiseptic and disinfectant qualities. If applied to exposed pulps, especially if the systemic condition of the patient is good, in nine cases out of ten we can succeed in saving them alive, even though they may have been much exposed and bleeding previous to the application.—JENNIE C. KOLLOCK, D.D.S.

THE

DENTAL COSMOS.

VOL. XXIV. PHILADELPHIA, MAY, 1882. No. 5.

ORIGINAL COMMUNICATIONS.

STUDIES IN THE HISTO-GENESIS OF THE TEETH AND CONTIGUOUS PARTS.

BY J. L. WILLIAMS, NORTH VASSALBORO, ME.

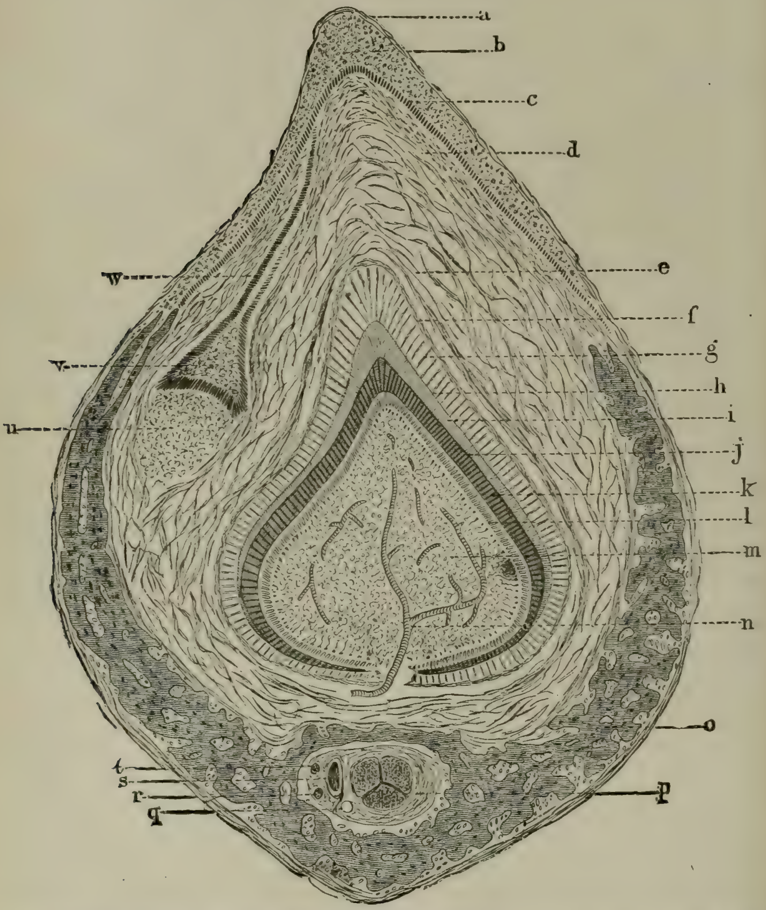
I PURPOSE in this paper to present a brief *résumé* of what is known at the present time concerning the development of the dental follicle and the surrounding osseous tissue. My own work has been largely confirmative, but I believe that I have a few points to present which, so far as I am aware, have not before been noticed.

Fig. 1 is an illustration drawn from a microscopic specimen magnified about thirty diameters. It is a transverse section, cut from the jaw of an embryo kitten, and shows the development of the temporary tooth at an advanced stage, and the commencing formation of the follicle of the permanent tooth. As the process of formation of the temporary and permanent teeth is nearly or quite identical, this one illustration shows two of the most important periods in the histo-genesis of the teeth. As the development of the teeth begins in the mucous membrane covering the jaws, a clear and definite understanding of this tissue seems to be of primary importance. The many different terms which have been used in describing this tissue, and the application of the same terms by different writers to essentially different parts, have made the study of mucous membrane exceedingly confusing to the beginner. I shall endeavor, as far as possible, to bring order out of confusion, and to describe this tissue in what I believe to be the most natural method—*i. e.*, in the order of its development.

The mucous membrane and the skin are continuous structures, and, anatomically speaking, quite analagous. They may, in a general sense, be divided into two layers, the *dermis* and *epidermis*. The external layer or epidermis is derived from the external germinal layer or *epiblast*, while the dermis originates from the *mesoblast* or middle

layer. These two layers are separated by a transparent, homogeneous structure which has received the name of basement membrane. The enamel-organ and dentine-bulb originate on opposite sides of this membrane, in which situation it is known as the membrana prœformativa of Raschkow. The epidermal layers of cells, which are external to this transparent layer, and rest upon it, have been divided

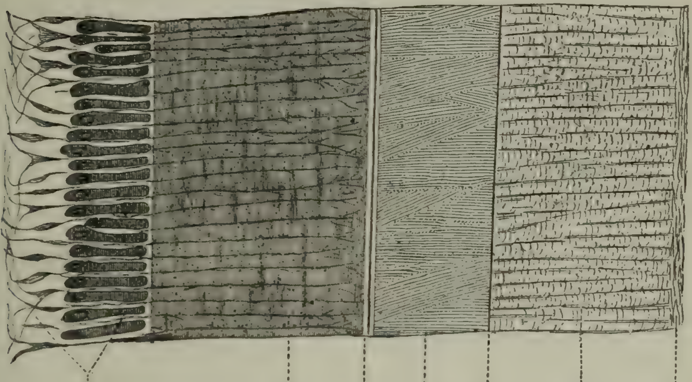
FIG. 1.



into several strata. Beginning at the basement membrane, the first layer is usually denominated the prismatic or columnar,—stratum Malpighii; above this, the layer or layers of "spinous" or imbricated cells; next, a layer of polyhedral cells, and externally the stratum corneum. This division is largely arbitrary, and it seems to me that the whole matter may be much simplified by regarding this external layer of the mucous membrane in the light of Beale's theory. The

inner layer of prismatic or columnar cells is the youngest or first formed, and those layers of cells external to this represent simply an advance in age and a decrease in the proportion of bioplasm or living matter. The external, or stratum corneum, is an accumula-

FIG. 2.



DESCRIPTION OF FIGS. 1 AND 2.

THE specimen from which Figs. 1 and 2 were drawn is a transverse section of the inferior maxilla of an embryo kitten. The entire jaw was decalcified very slowly in chromic acid. The reference-letters indicate the same position and elements in both drawings. Fig. 1 magnified about 30 diameters. Fig. 2 magnified about 450 diameters.

a. Layer of stratified epithelium.
b. Layer of polyhedral epithelium.
c. Layer of columnar or prismatic epithelium.
d. Connective tissue.
e. Remains of tooth-sac.

Also for Fig. 2. {
f. Outer membranous layer of enamel.
g. Layer of ameloblasts or enamel-cells.
h. Line between ameloblasts and completely formed enamel.
i. Layer of completely formed enamel.
j. Membranous lines between enamel and dentine.
k. Dentine.
l. Odontoblasts and special layer of branched and spindle-shaped cells, the base of the latter being continuous with the periphery of the pulp; the long filamentous processes of the apex of these cells pass between the odontoblasts and become the future fibrillæ of the dentine.
}

m. Inner portion of tooth-germ, or future pulp.
n. Artery.
o. Bone of inferior maxilla.
p. Inferior dental nerve.
q, r, s, t. Nerves, arteries, and veins.
u. Dentinal germ of permanent tooth.
v. Enamel-organ of permanent tooth.
w. Remains of epithelial cord, dropped down from *c*, the layer of columnar or prismatic epithelium, to form the enamel-organ.

tion of cells composed almost wholly of formed material—lifeless scales in which there is no bioplasm or living matter, ocurring in some situations. Lying beneath the epidermis, we find a dense connective-tissue membrane, which is called the dermis (the proper mucous

membrane, the mucosa, mucous layer, cutis vera, corium, chorion, etc.). Following this downward we find that it gradually merges into a loose subdermal connective tissue. The external portion of the dermis, or that part lying immediately beneath the basement membrane, is known as the *pars papillaris*, and the subjacent portion as the *pars reticularis*. The position and relation of these different parts may be best understood by referring to Fig. 1. *a* represents the external or stratum corneum; *c* the layer of prismatic cells, and *b* the intermediate layers. Immediately beneath *c* lies the transparent basement membrane (not well shown in the illustration), and below this the two layers of the dermis gradually merging into the loose subdermal connective tissue *d*.

The mucosa is a dense connective-tissue membrane, composed chiefly of bundles of fibrous connective tissue arranged as larger or smaller trabeculæ crossing each other in various directions. In the submucosa or submucous tissue (see Fig. 1 between *d* and *e*) the trabeculæ are separated by large interfascicular lymph-spaces. The first rudiment of the tooth appears at a time when the mucous membrane covering the jaw is vascular, embryonal, or gelatinous tissue—a net-work of branched embryonal cells. This rudiment is a prolongation of the stratified epithelium of the surface into the depth of the mucous membrane. This folding and prolongation of the mucous membrane has been called by Legros and Magitot a *bourgeon* or budding of the prismatic layer of epithelium. Its deep end increases in size, and it soon becomes invaginated by a papillary mass of nucleated cells which arise in the mucosa or dermal tissue. This papillary mass is the dentinal germ of the tooth. The enamel organ folds over it, the concavity of its under surface becoming more marked in conformity with the increasing convexity of the dentinal papilla. The surrounding dermal and subdermal connective tissue assumes a laminated arrangement, and thus is formed the tooth-sac.

The original bourgeon, from which the enamel organ is developed, retains its connection with the prismatic layer for a considerable time by means of a slender cord. (See *w*, Fig. 1.) As the growth of the tooth-sac over the enamel organ proceeds, the connection of this cord with the surface epithelium becomes gradually severed, and the cord itself is broken up and finally absorbed. A proliferation of the cells composing this cord sometimes occurs, and M. Magitot has advanced the opinion that these masses of cells may wander into the depth of the jaw and become the germs from which supernumerary teeth originate. The external layer of the enamel organ is composed of prismatic cells, inclosing a mass of polygonal epithelium cells. As development proceeds, we notice a peculiar modification of these last-mentioned cells. This change is due to an accumula-

tion of fluid in the interstitial substance between the cells, whereby they are separated and compressed, except at certain points of contact, until the mass assumes a reticulated or honey-combed appearance. The accumulation of fluid and the consequent compression gives to each cell a stellate form. These intermediate stellate cells finally disappear, and the two layers of prismatic cells are brought into contact, the inner one, which is in contact with the dentinal germ, constituting the layer of true enamel cells, and the outer layer is, I believe, transformed into a stratified layer, and becomes Nasmyth's membrane. (See *f*, Figs. 1 and 2.) The ameloblasts* and odontoblasts are at first only separated by the transparent basement membrane. The tissue of the dentinal germ or papilla is very vascular, and is composed of a net-work of nucleated cells.

The odontoblasts make their appearance very early as an epithelial-like peripheral stratum of large, more or less columnar cells. There is a wide difference of opinion regarding the formation of the dentine. According to Kölliker, Hertz, and others, the dentine matrix is an excretion of the odontoblast. I incline to the opinion of Waldeyer, Boll, and Klein that the odontoblasts elongate at their distal extremity, and that the dentine is successively formed by direct transformation of the distal portion of the cell. This view offers the most rational explanation of the existence of the protoplasmic net-work of the dentine as demonstrated by Prof. Heitzmann, Dr. Bödecker, and others. As this net-work originally forms a feature of the cell structure of the odontoblast, it only becomes necessary to demonstrate its persistence in order to account for its appearance in the fully-formed dentine. In carefully-prepared specimens there may be seen immediately below and partly wedged between the odontoblasts *a special layer of branched and spindle-shaped cells.* I have demonstrated to my own satisfaction that the fibrillæ are the elongated points of *these* cells, which pass between the odontoblasts, and so penetrate the dentine. The odontoblasts, I believe, are only concerned in the formation of the dentinal matrix, and have no direct connection with the fibrillæ. These cells, from which the fibrillæ originate, are branched at their lower extremity, and anastomose and become continuous with the branched cells which form the reticulum of the pulp-matrix, and thus is demonstrated that intimate relation which has always apparently existed between the fibrillæ and the pulp. (The odontoblasts and branched cells are finely shown at *l* in Fig. 2.) Boll first called attention to the great number of

* Prof. Eames, of St. Louis, introduced the term *ameloblast* [*Amel* (from the French *émail*), enamel; and *blast* (from the Greek *blastos*), germ], as an appropriate one for the inner layer, or true enamel cells.

non-medullated nerve-fibers in the superficial part of the pulp-tissue. The fibrils ascend between the odontoblasts, and it is probable, although not proved, that they ascend into the dentinal canals. The probability of the existence of exceedingly fine nerve-fibrils in the canaliculi becomes apparent when we remember that Beale, with his $\frac{1}{50}$-inch objective, has demonstrated nerve-fibrils $\frac{1}{200,000}$ of an inch in diameter.

Coincident with the formation of the dentinal papilla, the ameloblasts undergo a rapid and remarkable change. The nucleus, which was at first near the center of each cell, appears to recede towards the outer extremity. The change is an apparent one, however, and is the result of a rapid growth of that portion of the cell lying next to the basement membrane.

The enamel is formed by the ameloblasts of the inner membrane, in the same manner as the dentine is from the odontoblasts, viz: the distal extremity of the cells,—that is, the one next the dentine elongates, and this increment is directly converted into enamel. Kölliker, Kollman, and others, on the other hand, regard the enamel as an excretion of the enamel cells.

But the more recent investigations of Heitzmann, Bödecker, and Abbott contraindicate this view. The existence of a protoplasmic net-work in the odontoblasts and ameloblasts, and the demonstration of the persistence of this net-work in the completely formed dentine and enamel, would seem to be very strong evidence in favor of the view that these cells are directly converted into the respective tissues which they represent. The fully formed enamel-prisms are, to use a homely illustration, the petrified ameloblasts. A careful study of specimens in every stage of development has convinced me that there is no evidence of any direct connection, during the formative process, between the pulp and the ameloblasts.

The fact that calcification of the odontoblasts takes place from without inwards, and that calcification of the ameloblasts occurs from within outwards, or in an opposite direction, is also confirmative of this view.

There is a well-defined line (see *h*, Fig. 2) marking the limit of the completely formed enamel, and seeming to separate it from the ameloblasts, but it is probably quite largely the result of the chemical process through which the specimen has passed in its preparation. The wavy appearance, or interlacing of the enamel-prisms, as shown in *i*, Fig. 2, is rather more strongly marked in the engraving than in the original specimen, and in truth there are many points in any good microscopic specimen which it is impossible to reproduce in an engraving.

Fig. 3 was drawn from a longitudinal section cut from the artic-

ular extremity of the large bone of the leg of a common domestic fowl, magnified about 350 diameters. In connection with Fig. 1 it will serve us in calling attention to some points in the development of bone.

Bone or osseous tissue belongs to the group of connective tissues.

Bone is formed in two ways: by development in cartilage known as intra-cartilaginous or endochondral bone, and in membranes without the intervention of cartilage, and called inter-membranous or periosteal bone. Most of the bones of the skull and face are developed without the intervention of this solid hyaline cartilage. The process of development is essentially the same in both methods.

As the limits of a magazine article preclude the possibility of more than a brief reference to some of the more important points in the changes through which this tissue passes in its development, I have selected the specimen from which this drawing was made as showing most of these changes in a single view. The first stage in the development of endochondral bone is that of solid hyaline cartilage covered by perichondrium, this membrane being identical with periosteum. Like periosteum, the perichondrium consists of an internal and an external layer. The internal or osteo-genetic layer contains blood-vessels and numerous spherical cells (the future osteoblasts), which are the active elements in the production of bony tissue.

This osteo-genetic layer of the perichondrium sends longer or shorter processes (the periosteal processes of Virchow) into channels in the cartilage formed for them, and *probably by them*, through absorption.

Thus the cartilage becomes gradually permeated by a system of anastomosing channels containing a vascular tissue rich in cells. While this process of the formation of the primary marrow-cavities is going on, a corresponding change is occurring in the cartilage surrounding these cavities.

The lacunæ containing the cartilage-cells increase in size and the cells themselves become larger and more transparent. The lacunæ seem to break into each other and become confluent with the penetrating points of the growing marrow-cavities. The cartilage-cells themselves become disintegrated, and the ground-work separating the lacunæ becomes calcified (*not ossified*). The cells of the marrow-cavities arrange themselves (by active multiplication) as an epitheloid layer, osteoblasts, on the surface of the trabeculæ of calcified cartilage, and these trabeculæ gradually become ensheathed in true osseous tissue produced by the osteoblasts.

The place where this process first begins is called the *point of ossification.* As development proceeds, the calcified cartilage within the

osseous trabeculæ is gradually absorbed, and we have the condition of embryonal spongy bone.

The endochondral bone is subsequently replaced by a true periosteal bone, the process of which I will not now describe. If the fore-

Fig. 3.

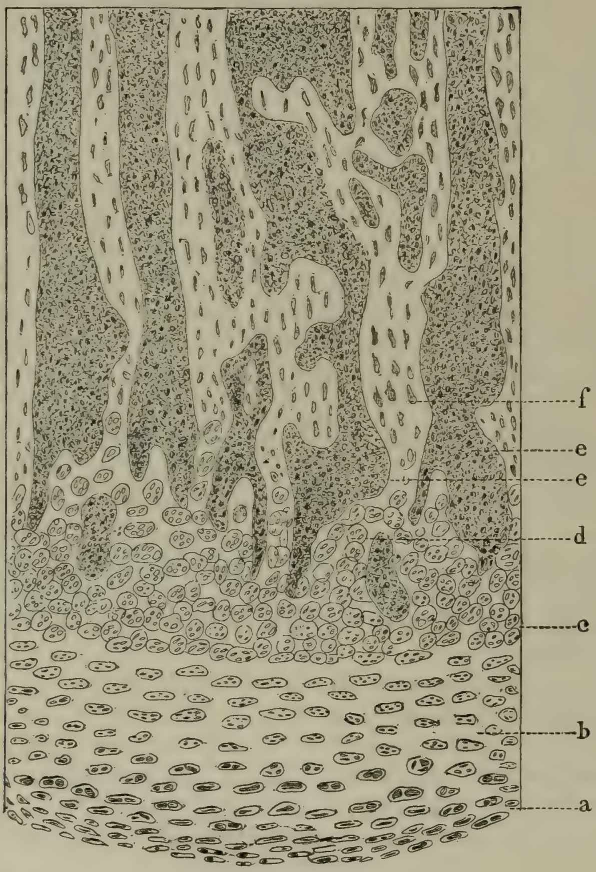


Fig. 3.—Cut from the leg-bone of a young domestic fowl.
a. Zone of flat cartilage-corpuscles at the knee-joint surface.
b. Zone of round multinuclear cartilage-cells.
c. Zone of large cartilage-cells breaking up and passing into marrow-cavities.
d. Region of calcified cartilage.
e, e. Marrow-cavities.
f. Trabeculæ of recently formed bone.

going has been carefully read we are now prepared to return to the illustration (Fig. 3).

a is the zone of flattened cartilage-corpuscles at the knee-joint surface. Immediately below this is a wide transparent layer of cartilage lacunæ containing multinuclear cells. This region repre-

sents the stage of hyaline cartilage in the formation of endochondral bone. Below this zone, at *c*, the lacunæ are seen breaking up and becoming confluent with the penetrating points of the marrow-cavities, the ground-work between them at the same time becoming calcified. At *e*, *e* are shown marrow-cavities, the contents of which are probably formed by direct transformation of the cartilage-elements.

The passage of the osteoblasts from the marrow-cavities into the spongy, bony frame-work of the jaw is well shown in the transverse section, Fig. 1, at *o*. In Fig. 3 the bony trabeculæ are shown at *f* in longitudinal section, but the shading is the reverse of Fig. 1, the marrow-cavities being dark instead of light, owing to a different method of staining.

I have, in this paper, only touched upon a few points in the histogenesis of the teeth and contiguous parts. My purpose in preparing this paper, as in the former one, has been in the hope that some one more favorably situated than I am, may take up this very interesting study, which offers a fine field for original investigation.

A CRITICISM CRITICISED.

BY WILBUR F. LITCH, M.D., D.D.S.,

PROFESSOR OF MATERIA MEDICA AND THERAPEUTICS IN THE PENNSYLVANIA COLLEGE OF DENTAL SURGERY.

In the March number of the *New England Journal of Dentistry* appears a criticism by the editor upon certain portions of my paper, "Antiseptics in Dentistry," read before the Pennsylvania State Dental Society, and published in the February number of the Dental Cosmos. These criticisms are clearly the result of a want of familiarity with the practical conditions attending the disinfectant treatment of putrescent tooth-interiors, and in the interests of practical dentistry it seems desirable that they should be replied to in the journal in which my paper was published.

In the paper in question, I recommended as a disinfectant a nearly saturated solution of iodine and carbolic acid in alcohol, claiming what, of course, is not denied, that the iodine unites with the hydrogen element of putrefactive gases—chiefly H_2S, sulphureted hydrogen—precipitating the sulphur and forming with hydrogen hydriodic acid gas in solution, which gas being in solution, "*under the conditions ordinarily present in the pulp-chamber*, may cease to be regarded as a factor in pressure."

Prof. Mayr's criticism is as follows: "Dr. Litch loses sight of the fact that this solution of hydriodic acid *immediately* will decompose

the lime-salts of the tooth surrounding it, forming calcium iodide; it will free the carbonic and phosphoric acids; the latter will in turn decompose some more carbonates of lime, and then Dr. Litch will readily see that the volume of carbonic acid gas generated will be equal to that of sulphureted hydrogen decomposed. Nothing is gained, and the hydriodic acid by this decomposition becomes as powerful a factor in pressure as the gases of putrefaction were before its formation."

Were it true that the volume of carbonic acid gas generated by this action of hydriodic acid upon the lime-salts in the teeth would "be equal to that of the sulphureted hydrogen decomposed," this might be accepted as a valid criticism; but "*under the conditions ordinarily present in a pulp-chamber*," nothing could be more divergent from the truth.

What, in brief, are the conditions in and around a putrescent pulp-chamber? First, its walls are composed of dentine, containing only five or six parts in the hundred of calcium carbonate to sixty-four or sixty-five parts of calcium phosphate. Secondly, the putrescent pulp-chamber and the tubuli opening into it are surcharged with putrefactive matter, giving off volumes of sulphureted hydrogen and volatile organic acids. Into this excess of putrefactive gas is placed an excess of iodine, distributed throughout the permeable mass of cotton fiber with which the dressing is carried to and retained in the pulp-chamber. The reaction between the sulphureted hydrogen in the pulp-chamber and the iodine is almost immediate, and the products are hydriodic acid and sulphur, the former held in solution, and the greater portion of that solution not being brought in direct contact with the walls of the pulp-chamber except under the slow operation of the laws of diffusion. Prof. Mayr is surely mistaken in affirming that under these conditions, by the action of a weak solution of hydriodic acid gas upon the small amount of carbonate of lime in the dentine, "the volume of carbonic acid gas generated will be equal to that of the sulphureted hydrogen decomposed." There is no possible relation between the two reactions. That they may and do go on together is, of course, not denied; but they are in no sense dependent the one upon the other; and the doctrine that the slow action of a weak solution of so weak an acid as hydriodic acid upon so dense a structure as dentine, proceeds in *equal* ratio with the rapid action of iodine upon the volatile and readily decomposed sulphureted hydrogen gas, and that therefore "nothing is gained, and the hydriodic acid by this decomposition becomes as powerful a factor in pressure as the gases of putrefaction were before its formation," is utterly untenable.

I have before me a section of adult human dentine, which, after

being highly polished, was wrapped in cotton, the cotton saturated with tincture of iodine, and the iodine converted into hydriodic acid by the action of sulphureted hydrogen, precisely as in a putrescent pulp-chamber. In this wrapping, thus saturated with a distinctly acid solution, the dentine was allowed to remain forty-eight hours. Upon removal, only the faintest line of erosion could be seen under the microscope, and to the unaided vision the polish did not appear disturbed. Thus much for the extent to which dentine is practically acted upon in the process under consideration. It is evident that the amount of carbonic acid gas derived from the reaction must be exceedingly minute, and quite as incapable, under these conditions, of becoming a factor in pressure as is hydriodic acid gas itself.

One other point may require a few words of further elucidation, namely, the influence which solution in water exercises upon the dynamic power of gases. Precise data as to the degree of solubility of hydriodic acid gas are not available, but, according to Otto, it is as soluble in water as is hydrochloric acid gas, and of this gas one volume of water, at ordinary temperatures, say 70° F., will take up over four hundred volumes, while the volume of water with this amount of gas in solution will increase only about one-third; so that a pint of water after taking up in solution four hundred pints of hydriodic acid gas will measure but a pint and a third. Less gas will be absorbed by water at blood temperature, but the difference is not very great, and is not at all sufficient to affect the principle or interfere with the practical result. Clearly, the one, two, or three drops of water which the average pulp-chamber with its associated tubuli is quite capable of holding, and which either the tubuli themselves or the solution of iodine and carbolic acid are quite capable of furnishing, will amply suffice to reduce to solution and render incapable of exercising pressure any amount of hydriodic acid gas likely to be generated in an ordinary pulp-chamber during the progress of proper disinfectant treatment.

These theoretical considerations are amply sustained by practical results. I have repeatedly cleansed mechanically highly putrescent pulp-chambers, inserted the iodine dressing, and at once hermetically sealed the pulp-cavity with a gutta-percha stopping, without the slightest evidence of the existence of gases under pressure being manifested, even after the lapse of several days. Every practical dentist knows that this is rarely possible with carbolic acid or creasote used alone. My general practice is to close the pulp-chamber with gutta-percha at the second dressing, but if the pulp-chamber is sufficiently large to hold a liberal amount of the iodine solution, and if there is no evidence of inflammation of the root-membranes, sealing at the first dressing is a safe procedure.

A further criticism by Prof. Mayr is upon the following statement: "Moreover, should there be oxygen compounds present in the pulp-chamber, the hydriodic acid itself may be regarded as a disinfectant, inasmuch as through its strong tendency to combine with oxygen, the HI would be decomposed, water, H_2O, formed, and iodine set free for new combinations with hydrogen."

"This," says Prof. Mayr, "is utterly impossible. First, no free hydriodic acid can exist in a capsule of lime-salts, as the pulp-chamber is. Second, in a liquid where there is free oxygen there is no free hydrogen for the iodine liberated from the hydriodic acid to combine with, hence there will be no such reaction possible as he describes."

In this, too, Prof. Mayr is in error. First, free hydriodic acid can exist for a long time in such a capsule of lime-salts as bone or dentine. I have made the acid in a capsule of bone, which contains a greater proportion of calcium carbonate than dentine, and, still in the capsule, allowed it to be decomposed by simple contact with the oxygen of the atmosphere. Second, if free oxygen is present in a putrescent pulp-chamber—and it always is present with a dressing, for it is impossible to exclude all atmospheric air—*free* hydrogen is not essential for combination with the iodine released from the hydriodic acid by the action of the oxygen; surely, the H_2S, sulphureted hydrogen will serve,—the very gas whose decomposition by iodine is the chemical reason for the use of that agent in the mode of disinfectant treatment under consideration.

The facts are against Prof. Mayr's theory, and the authorities are against him. Eliot & Storer's "Manual of Inorganic Chemistry" says: "Iodohydric (hydriodic) acid is a compound which decomposes easily. * * Chlorine and bromine abstract hydrogen from it and leave iodine free, *and the same effect is produced by many oxygen compounds which readily part with oxygen.* * * The decomposition of iodohydric (hydriodic) acid is so rapid that the pure colorless solution of it becomes red from separation of iodine after a few hours exposure to the air, no matter whether it be dilute or concentrated."

Watt's "Dictionary of Chemistry" says: "With many *organic compounds* hydriodic acid reacts in the same manner as with inorganic compounds, sometimes deoxidizing them, *with formation of water and elimination of iodine*; sometimes simply exchanging its hydrogen for a radical of the organic compound." Prof. Mayr will find it difficult to harmonize his statements upon this point either with the facts of chemistry or the teachings of chemists. In the criticism in question Prof. Mayr advances the theory that carbolic acid is an essential chemical constituent of creasote, and that there is "no creasote possible without it." This theory may be correct; but it is equally

as much at variance with recognized authorities as are those of his positions which have just been the subject of consideration. Prof. Tidy, in his "Hand-Book of Modern Chemistry, Inorganic and Organic," gives no less than eight tests as aids to distinguish carbolic acid and creasote, the one from the other; and all other authorities of which I have any knowledge regard them as closely allied, but still, though generally associated in commercial creasote, chemically distinct substances.

THE AMALGAM QUESTION.

BY J. FOSTER FLAGG, D.D.S.

That two such remarkable papers as the leader and editorial of the *Ohio State Journal of Dental Science* for January, 1882, should have been seriously presented for the consideration of dentists is, to say the least, surprising; but when it is recognized that, in the face of an accumulation of *facts* which have proved so irresistible as to have practically swept away all the enunciations antagonistic to the filling-material known as amalgam, the antiquated blasts of *forty years ago* are repeated, what must we think of it? It is retrograde metamorphosis, surely!

The "leader" is a paper by Dr. Talbot, of Chicago, and is a statement of a line of work to prove that mercury is "volatile at all temperatures"—a position which, I believe, is not disputed—together with a series of experiments, which rival the celebrated work of Prof. Westcott, with diluted acids, which were accredited with the power to cause dental caries, *because* they "softened the enamel so that it could be scraped off with the finger-nail!"

The experiments really do not bear as much actual relation to the filling of teeth as did these strange expositions to the decay of the teeth.

The paper opens with the old *garbled* statements in regard to the early doings about amalgam.

It is noteworthy that it seems impossible for the opponents of amalgam to make other than unfair and partial statements of these things, and this, too, when it is so easy for anyone to see that this is so.

The advocates of amalgam, in giving the history of these matters, tell "the truth, the *whole* truth, and nothing but the truth." Its opponents reiterate statements which were made, and which are *now known* to be *false*, and, taking *parts of statements* which favor their views, leave out that which is damaging even to destruction.

It is stated that, from the first, "the better class of dentists waged war against it"—amalgam—"on general principles" The present

condition of things would seem to render it a matter of doubt as to whether the warriors were entitled to the distinction of "better;" if so, it seems a pity that the "better" men should have been so badly beaten!

It is quoted from the "History of American Dentistry" that the performance of the adventurous introducers of amalgam "caused our staid and dignified dental ancestry to bound with surprise and indignation," when the truth of the matter is that *the filling and saving* of hundreds of teeth which had been pronounced by the "staid and dignified" as impossible to fill and unworthy to save was the real cause of the bounding!

The next sentence in the paper *speaks volumes.* "From that time onward the use of amalgam has increased, until now tons are consumed yearly in filling teeth." A hundred such papers as Dr. Talbot's would only weigh as the dust in the balance against this *one* overwhelming *fact.*

It is then given as the report of the committee of 1841 that "there was no tooth in which caries in it could be arrested and the organ rendered serviceable by being filled, in which gold could not be employed. This report was unanimously adopted."

Such statements as this, given without comment, are used to shed their portion of the general air of condemnation to amalgam which pervades the paper—and this, too, with the knowledge that thousands of excellent dentists, together with a large majority of the best informed, most skillful, and most successful practitioners of the present day, *know* and *assert* that this position is absurdly fallacious, and that the fact of the "unanimous" adoption of such a report is simply a sad commentary upon the foolish ignorance and prejudice of those days.

The report of the Medical Committee of the County of Onondaga, New York, is spoken of, and it is stated that "the report of the Medical Committee was to the effect that no care in the combination or use of the paste will prevent its occasional bad effects."

In the midst of the excessive luminosity which medicine has shed upon dental effort, this *work* of the Onondaga gentlemen stands preeminent! No mention is made of the fact that amalgam was given to this committee as a *mineral* compound—that it was received *as such,* and reported upon *as such* in these words: "That the mineral paste has produced, in many instances, the peculiar effects of mercury, though in different degrees of intensity—in some slight, in others severe and alarming—there can be no doubt. The committee believe that the proportion of such cases is small, compared with the whole number operated upon, but that no care in the *combination* or *use* of the paste will prevent its occasional bad effects."

This report truly reminds us of some of the reports of committees, and discussions thereupon, more nearly connected with our specialty than is the Onondaga effort. They are reporting upon an exclusively *metallic* compound, and call it a "*mineral* paste." This compound has always been "combined" and "used" in *but one manner* and in *but one way*—whether it is soft or hard, plastic or powdery, washed or unwashed, it is *practically* the same combination, and is *practically* "used" the same. But of all these things the Onondagaians were uninformed. It might then be pertinently questioned, What business had they to "believe?"

The summing up of this portion of the paper is a reference to the resolution of the American Society of Dental Surgeons to rescind the "amalgam pledge," a pledge *not to use any amalgam*, which enforced expulsion of all members refusing to sign it, and under which a number were expelled, and it is stated in the paper, "Thus ended the amalgam war." No mention is made of the *little* closing paragraph of the rescinding resolution; that disgraceful avowal; that stench in the nostrils of all honest men, which gave to dental history the statement that the amalgam pledge was rescinded *because* "the resolutions had accomplished the object for which they were designed, and there no longer existed any necessity for their enforcement." Who would be found fighting for a cause which required such abominations for its support?

Next follows in the paper a series of experiments which may possess some value as indicative of a deviation from the beaten track of the advocates of gold-foil in experimentation, and as possibly demonstrative of an eventual emergence into the light of the broad scientific surroundings of the advocates of amalgam.

These seem conclusively to re-prove a position which has been so well proved that, as Prof. Watt very appropriately remarks, "it seems like a waste of time" to have done it. And yet so important was it thought to be that this undisputed fact should be incontestably established that the "highest chemical skill" was "brought to bear upon the experiments."

Among the many who may justly be regarded as eminent authority in matters pertaining to chemical research, it seems invidious to designate anyone as preëminently superior, but it is well to know, in view of possible future experimentation in behalf of dental chemistry, that the high*est* skill is to be found at Rush Medical College, of Chicago.

But must it not have been amusing to one so erudite, that his immense resources should have been enlisted in a work so palpably unworthy of such gigantic grasp!

If good reasons for *doubt* as to the truth of the position that

mercury vaporizes at ordinary temperatures had been thought to have been discovered, then, indeed, high authority might well have been consulted as to the value of the reasoning, but for the further proving of the accepted fact additional authority seems as little requisite as it would be to prove that the earth is spheroidal, or that it makes diurnal revolutions.

After the disposal of this vaporization of mercury, then begin the wonders of the paper. Such a *peculiar* line of *work* (?) and such *very* peculiar deductions therefrom, such attempts to prove a theorizing which "all the rest of mankind" *know* has no foundation in facts, is wonderful, almost beyond comprehension, and certainly extraordinary beyond parallel.

The first case given is that of—John T. Smith,—rather an equivocal name, but who is reported as having died a vastly more equivocal death. John Smith had a *lower* molar filled with amalgam; a subsequent swelling occurred, which, by its magnitude and extent, hindered respiration. Finally respiration ceased altogether, and, as a consequence, the "unfortunate man" died. It was made clear to the jury by the attending doctor that the mercury in the amalgam filling caused the death.

First Query.—If the jury had been composed of *well-educated dentists*, is it probable that "the doctor" could have made the same thing *clear* to them?

Second Query.—Would it not be in order that the *several hundred* John Smiths who have had lower molars filled with amalgam, and whose respiration has not yet been "hindered," should be called upon to offer "rebutting testimony?"

The next case is that of a lady who suffered "debility," "dyspepsia," "paralyzed sensation in the tongue," "strong metallic taste," "metallic odor to breath," "free flow of saliva"—estimated at a pint each night—"together with tenderness of gums and salivary glands." The patient wore a piece of rubber work and had two amalgam fillings. Upon the removal of the fillings, and the substitution of *gold* work for rubber, all unpleasant symptoms passed away and the soreness of the tongue was healed.

I had a case which was sufficiently similar to this one to be a "parallel"—the symptoms were as like as those of one patient could be to those of another; the difference was only in length of time, my case being more acute. The whole trouble was caused by a *gold* plate!—even *coin* gold was tried, but *it* was proven to "*vaporize*" too much. The peculiar "coppery" *taste* and *odor* of *mercurial* ptyalism were too apparent to admit of a doubt as to the *gold* being the cause! The plate was abandoned, and the patient promptly recovered.

A "forcible illustration" of the effects of vapor of mercury is given in the paper as having occurred on board the man-of-war "Triumph." This seems rather a *mal-à-propos* name for a man-of-war fighting as an opponent of amalgam, as the necessity for re-naming the ship "Defeat" is too inevitable, but "nearly all the crew were salivated" from the vapor arising from *only thirty tons* of quicksilver!

As it would seem proper that I should have a ship story, I would direct attention to the no less "forcible illustration" of the *marked benefit* arising from exposure to mercurial vapor which will be found recorded in "Ziemssen's Cyclopædia of Practical Medicine," Vol. I., p. 512: "The efficacy of prophylactic medicine is very doubtful, although quinine is highly recommended for this purpose by Cummings, and mercury by Walker, of Jamaica.

"The latter gained its reputation through a peculiar incident. On the occasion of the capture of Fort Omra, the yellow fever broke out among the land-forces as well as on the fleet, and decimated the men. One of the captured ships was struck by a shot in such a way that the quicksilver with which it was loaded ran out of the vessels containing it. The sailors who were ordered to gather up the valuable cargo did so, using their bare hands; and all who were employed in this way during their stay in that region remained perfectly well, although surrounded by sickness and death." (La Roche, *loc. cit.* Vol. II., p. 762.)

But now we come to the serious portion of the conflict. In order to ascertain the effect of vapor of mercury, it was employed in a series of experiments upon living things, and the first suggestion, which is impressed, if it proves to be successful, is a boon, indeed, to infested humanity. *It almost rivals the boon of amalgam itself as a filling-material.*

This suggestion is the employment of mercury as an anti-roach remedy. Its vapor is supposed to have caused the sudden disappearance of roaches from the experimenter's laboratory, and if this supposition should be verified by experiment, from the domestic stand-point the knowledge thus imparted would be of incalculably more value to man—or, at least, to woman—than have been all the thirty-dollar gold-fillings that have ever been inserted.

The apparent antagonism existing between cock-roaches and mercurial vapor having been noticed, these insects were placed in bottles, which were either empty or contained mercury or amalgam filings. In every case the cock-roaches died much sooner when exposed to mercurial vapor than when placed in empty bottles. *Ergo*, amalgam is not a good material with which to fill teeth.

A guinea-pig was put in a four-quart jar with four ounces of mercury; he was taken out twice a day for exercise and nourishment;

he lingered for two weeks, became emaciated and trembling, and finally died. *Ergo*, amalgam is not a good material with which to fill teeth.

An amalgam filling was placed at the base of a sensitive plant; in four days the extremities of the leaves were dry and brittle, and at the end of ten days, notwithstanding care and nourishment, the plant died. *Ergo*, amalgam is not a good material with which to fill teeth.

These are certainly curious and interesting results from the entomological, the zoological, and the botanical aspect; but, recognizing little similarity between cock-roaches and guinea-pigs, and the patients for whom I operate, *and yet*, perceiving some little analogy between the most delicate among them and the sensitive plant, while I cannot accept the *ergo* in any case, *especially in view of the* FACTS established by an experience of twenty-five years' using of amalgam as a filling-material, I would nevertheless call attention to the results of an experiment which has now stood the test of nearly four successive years.

In the year 1879 a favorite cat died. It was placed at the "base" of an unpromising Concord grape-vine, which has since been plentifully supplied with manure-water. The result is gratifying in the extreme; luxuriant growth has been attained, with bountiful return of fruit, which, though grown on Concord stem, has a delicious Catawba flavor; nothing could be finer or more satisfactory. *Ergo*, dead cat, either soft or cohesive, is a *good* material with which to fill teeth; and, for the assuring of continuously satisfactory results, the mouth should be rinsed frequently with manure-water.

(To be continued.)

PIECES OF PORCELAIN FOR FILLING CAVITIES OF DECAY.

BY MARSHALL H. WEBB.

For a number of years a few operators have occasionally inserted a piece of carefully selected porcelain in a large cavity within the labial wall of an incisor or a cuspid tooth with oxychloride of zinc, and afterwards filled in foil between the porcelain and the margin of enamel, thus presenting only a narrow line of gold to view.

During and since the year 1870, when he was practicing in Reading, Pa., Dr. F. Hickman frequently used pieces of porcelain crowns in filling large cavities of decay in the buccal and masticating surfaces of molar teeth. These pieces were selected from porcelain crowns made for other work; they were fitted accurately to the margin of the cavity to be filled, and inserted in either gutta-percha or oxychloride of zinc, the material filling the interstices between the porcelain and margin of the cavity. Dr. Hickman did not build in

gold between the porcelain and enamel afterwards, however, as in cavities within the labial wall of an incisor or a cuspid tooth.

Dr. E. T. Starr has recently devised various sizes and different forms of porcelain for use in filling cavities, and these pieces of porcelain are so well shaped that, besides slight beveling of the edges, but little trimming is necessary to prepare them for insertion. Those with a platinum pin inserted in each can rarely be used excepting in pulpless molars.

In inserting pieces of porcelain, the shade and shape of the piece to be used in each case must first be carefully selected, after which the rubber-dam ought to be applied, the cavity prepared, the porcelain fitted and inserted. If the piece is to be placed in a cavity in the masticating surface of a molar tooth, the entire cavity ought to be filled with oxychloride or oxyphosphate of zinc, and while the cement is yet sufficiently plastic the porcelain must be pressed to place and the surplus material that escapes should be trimmed away at once, thus exposing the margins to view. After allowing ample time for the cement to harden, the rubber-dam should be removed and the porcelain trimmed down with corundum-wheels till proper occlusion of the teeth is had.

Oxychloride and oxyphosphate of zinc, as well as gutta-percha, wear away some, but when only a narrow line of the material is left between the enamel and the porcelain attrition does not impair the operation, and further decay is not likely to take place.

Gutta-percha ought to be used in the filling of cavities within the buccal walls of molar teeth, and especially where the cavity to be filled extends to or under the margin of the gum, because this material is not dissolved and washed away by the fluids of the mouth. After the piece of porcelain has been properly fitted, it should be heated just enough to soften the gutta-percha previously placed in the cavity and allow of its being pressed at once to place. After trimming away the gutta-percha to the margin of enamel and porcelain, first with a warm, flattened burnisher, and then with chloroform applied on pellets of Japanese bibulous paper, the operation is completed and the rubber-dam should be removed. Even though the surface of the porcelain be on a line with that of the enamel surrounding it, the gloss left from the burning of the piece should then be removed with Hindostan stones, because a less artificial, and therefore a finer, appearance in the mouth is presented.

*

*Section of a molar tooth showing the position of a piece of porcelain in oxychloride of zinc. The thickness of dentine remaining below the cement is shown where a part of the pulp-chamber was exposed in the preparation of the specimen.

Previous to filling with gutta-percha, or with any material other than oxychloride or oxyphosphate of zinc, one of these cements ought to be placed in the bottom of all deep cavities as a non-conductor of the currents incited by heat and cold in the dentinal fibers, that the pulp so nearly exposed may be better protected than by gutta-percha, or that, after a metallic substance is inserted, thermal changes may not produce shock.

Pieces of porcelain cannot easily be inserted in any but what may be called large-medium, or in extensive cavities of decay, and it is scarcely necessary to try inserting them in other than these, because it usually requires comparatively little time to fill small cavities in the masticating and buccal surfaces of molars and bicuspids well with gold by the aid of the electro-magnetic mallet.

When cavities are carefully prepared and the pieces of porcelain are properly fitted, inserted, and finished, these operations not only present a finer appearance, and protect the margins of enamel better than those made of amalgam, but they can be made more durable than fillings of any plastic substance or any known material excepting gold.

PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

Regular meeting held at the residence of Dr. J. W. Clowes, Tuesday evening, January 17, 1882.

President Dr. S. G. Perry in the chair.

Incidents of Office Practice.

Dr. Jarvie. I have a matter here [showing plaster cast of a mouth]. It is not an unusual case, but to me it is shrouded in so much mystery that I should like to ask a question. This is a cast of the mouth of a lady thirty-five or forty years of age. Five years ago her four superior incisor teeth were normal in length and shape. To-day the two centrals have wasted away, perhaps one-fifth of their entire substance; the laterals not nearly so much, and the eye-teeth are hardly affected. The labial and lingual surfaces are equally wasted, and both surfaces are as brightly polished as it is possible to be done by any mechanical means. The lady has not been in very good health, has been affected by dyspepsia in an acute form; but the question is, What has caused this wasting, and what shall be done to arrest it?

Dr. Dwinelle. Is this in the nature of wasting about the necks of the teeth?

Dr. Jarvie. Not at all. It is on the cutting-surfaces. The necks

are not disturbed in the least. It is not in the nature of that kind of absorption. It is not caused by attrition, because the incisor teeth do not touch, but, as you see, they are wasted away to a knife-like edge.

Dr. Dwinelle. Evidently a chemical action. We know that under the constitutional effect of iodide of potassium the teeth are apt to sympathize, and that peculiar absorption around the necks of the teeth is induced. I have seen it go to the very centers.

Dr. E. S. Niles, Boston. A patient of mine has been suffering for the last three years from what was at first supposed to be paralysis of the rectum; the next supposition was enlargement of the prostate gland. Dr. ——— was called and pronounced it stone; he performed an operation and removed a stone by the crushing process weighing 450 grains. He is a gentleman of very robust frame and good constitution; had no decay about his teeth except a small cavity in the right superior bicuspid. The teeth were of good texture, but his gums had receded on some to the apex of the roots. I cleaned them thoroughly, and wish to report it as one case in proof of my theory of phosphatic diathesis in odontolithus. I intended to have the stone here to present to you to-night, and also to have models of the gentleman's mouth. He came to the office to have his teeth cleaned; I gave him two or three sittings; meantime he took cold and is now confined to his bed, and it was impossible for me to get models of his mouth to bring. The analysis of the stone and of the deposit about his teeth compared shows that they are very nearly alike.

Dr. Mills. Do I understand that the phosphate causes the recession in the gums?

Dr. Niles. I understand it so; the phosphate being precipitated from the saliva, which in turn derives it from the excess in the circulation.

The following paper, on "Phosphoric Acids, Zinc Phosphates, and the New Metal Actinium," was then read by Dr. Niles:

I was led into the study of the cements for dental purposes because of the very uncertain and unsatisfactory results attending their use. One package gave confidence only to be dispersed by the second, and a fresh compound that worked with certainty at first would be found full of uncertainty at the end of a few days or weeks. After considerable work, I succeeded in analyzing a large number of the best compounds in the market. The active principle I found to be the well-known chloride of zinc and the oxide of the same metal, or magnesium oxide. Phosphates are simply pyrophosphoric acid and zinc oxide. The inert substances in these preparations (excepting actinium), intentionally introduced or impurities, comprising one-fourth to one-third their bulk, are as follows: Phosphate of soda,

oxides of alumina, cadmium, manganese, antimony, iron, arsenic and silica. Some of these may have been intentional ingredients, but they were most likely accidental impurities in the substances used; however, nearly all of them are of no use, as they do not render the cements hard or insoluble.

My trouble with cements proved to arise from impurities, and defective preparation and bottling for use. Those who have furnished our preparations tell us, and truly, that no two lots of phosphoric acid or oxide of zinc in the shops are alike, and thus we are unable to get two lots of filling-material that act alike, or, if satisfactory at first, it deteriorates before or after it comes into our hands.

All the acids manufactured from phosphorus are powerful absorbents of moisture, as well as the chloride of zinc; the same is also true to a great extent in regard to the oxide after being calcined at a very high heat, and this is doubtless the solution of the trouble experienced with cements deteriorating. Moisture is absorbed from the air through the corks, or as the bottles are opened in the use of their contents.

After some study of the subject, I sum up the matter as follows: There are four acids derived from phosphorus, and, although they differ only in their basisity by from one to three molecules of water, they form, when combined with bases, entirely different salts.

Until a comparatively recent time, all these acids were derived from the product of burning phosphorus in air; this produces a white powder, the oxide, or the first acid (anhydrous phosphoric acid), the formula of which is P_2O_5. By adding water it becomes hydrated, and forms the metaphosphoric acid (H_2O,P_2O_5); this is recognized by its giving a gelatinous precipitate with nitrate of silver. By adding more water and boiling, another molecule of water is taken up, and the third acid is produced, or pyrophosphoric acid ($2H_2O,P_2O_5$), which is recognized by giving a white precipitate with nitrate of silver only after ammonia is added. Add still more water and boil for a very long time, and the fourth or last acid is formed, the orthophosphoric acid ($3H_2O,P_2O_5$); this gives a yellow precipitate on applying the same test as the last.

Until of late years the orthophosphoric acid has been derived wholly by boiling the anhydrous with water. Professor Markoe, of Boston Highlands, was the first to manufacture it by the action of nitric acid, bromine and iodine upon phosphorus. We have, then,

Anhydrous phosphoric acid,		P_2O_5,
Metaphosphoric	"	H_2O,P_2O_5,
Pyrophosphoric	"	$2H_2O,P_2O_5$,
Orthophosphoric	"	$3H_2O,P_2O_5$.

All of these acids, with perhaps the exception of the first, are

kept and sold under the general name of phosphoric acid; usually we meet with the pyrophosphoric, commonly known as glacial acid. Since the discovery of the new process for manufacturing the tribasic it has generally taken the place of the glacial for medical purposes on account of its purity; most of the glacial acid is a German preparation, and contains from twenty to thirty per cent. of phosphate of soda. It is well known that this is the acid universally in use for the manufacture of our phosphate of zinc filling-materials.

The liquid, then, that comes to us in these compounds is nearly one-half phosphate of soda, which is inert and perfectly soluble in water, and must therefore greatly impair the durability of this class of filling-materials. The fact that phosphate of soda is inert doubtless assists in regulating the time of setting, and, like any other phosphate, would be useful only in toning down the acid by its affinity being partially satisfied by it. In view of these impurities, and the fact that the affinity of an acid for a base or salt may be indicated by its basisity, it occurred to me that the four acids in pure state could be proportionately mixed and boiled to a certain specific gravity, to unite with a powder and form a more insoluble compound.

After considerable trouble in getting my acids pure, I was able to see my theory demonstrated; in fact, my liquid, of a brownish-gray color, worked well with oxide of zinc, producing the most insoluble compound I had seen. (My tests are the usual tests for density and solubility in vegetable acids, like acetic; for alkaline tests dilute caustic potassa or soda is used.)

Most of our commercial zinc comes from France, England, and New Jersey. None of the zinc from these sources is pure, either in the metal state or in the oxide. It is evident that to perform experiments intelligently one must know the substances that are being used, to start with. Some of the impurities in zinc are, however, beneficial, as silica, actinium, and tin; but, not having mixed them, we cannot well discover in what proportions they are present. First, the oxides or salts must be precipitated by the proper reagents, then mixed in the right proportions and fused to a solid mass in a reverberatory furnace; this should be done to a certain degree of heat to produce the desired suboxide. The product obtained may then be ground, and the compound colored with triphosphate of silver as desired, using the same salt of alumina to give the required cohesive properties.

Actinium oxide and sulphide, all through my experiments, have been sources of annoyance and confusion.

Its discovery, last September, by Dr. Fipson, F.R.C.S., of London, threw much light upon my work. The sulphide, a canary yellow, very closely resembles the same salt of manganese.

Zinc ores contain four or five per cent. of actinium. Its suboxides unite with the suboxides of zinc when fused, forming a mass very much resembling silica; a powder from this, combined with the stronger acids, forming a valuable filling-material.

At present the only source of actinium is from zinc, and none of the pure metal has been isolated; so that the difficulty of preparing cement from this substance is apparent. A very good substitute is made with silicate of zinc, or alumina, or oxide of tin treated in the same way.

This forms a powder which combines with the acid and sets quite quickly, forming a compound insoluble in the fluids of the mouth when normal, and sparingly soluble in strong acetic acid.

We are all aware that it is a desirable quality in a cement that it should set quickly, allowing simply time enough to introduce it thoroughly into the cavity. This is regulated as desired, either by the proportions of the acids or by reducing the powder in calcining.

It is evident, from the rise in temperature and the disappearance of the acid when mixed with the powder, that a chemical action takes place and a phosphate of the powder is formed; it is a fact, also, that a given amount of acid can only unite with a quantity of powder sufficient to satisfy its affinity, and if there is an excess of powder the compound formed is brittle and crumbly, admitting moisture; on the other hand, too much acid makes a dangerous substance, soluble in water and destructive to the tooth.

Phosphates then should be mixed to a putty-like mass, and when set should form a neutral material; this may be determined by powdering a lump of the filling, beating it up with distilled water, and testing with litmus.

Phosphoric acids are all powerful absorbents of moisture, as has been said, so much so that it is impossible to preserve them in glass, rubber, or cork-stoppered bottles; so the liquid put up in this way is constantly deteriorating. This is the universal testimony of those who have used these filling-materials. It is also true that the powder, if exposed, may bring about the same result when mixed with the acid. It absorbs moisture, like plaster-of-paris, from the air, and becomes unfit for use.

To overcome these objections, I conceived the idea of inclosing sufficient of the powder and acid for use at one time in separate sealed glass tubes or capsules. This serves to keep all except what is wanted for immediate use stopped and away from air; also, it is convenient to use, cannot be upset or wasted when used, and enough is inclosed in each capsule for the largest cavity, and may be mixed to the required consistence.

Thus I believe we can have a reliable phosphate filling-material

that will not deteriorate, and if introduced, free from moisture, with good judgment in deciding when and in what teeth, and where they should be filled with it, it will prove a valuable material for dental use.

Dr. Howe. In response to an invitation of the society, Dr. J. F. Flagg, of Philadelphia, has written me a letter, in which he refers to the subject of the evening, thus:

PHILADELPHIA, January 11, 1882.

My Dear Dr. Howe:

I have received your kind invitation for the 17th, but my engagements and duties, together with my uncomfortable physical condition, will not permit me to accept. The subject is one which *has had* much more interest to me than it now has, for my extended experiments have seemed to demonstrate a *range of possibility* for usefulness which, though valuable, is yet *too limited* for the attainment of much satisfaction. If you can obtain a copy of my "Plastics and Plastic Filling" (you can from our mutual friend, Dr. Lord), I should esteem it as a favor that you would read *for me*, to the gentlemen of the "Odontological," the few lines of "Conclusions," page 173, for nearly another year's experience has but confirmed the correctness of them.

I would also like you to call the attention of the members, especially to the *seventh*, or taste, *test*. If an oxyphosphate or zinc-phosphate is only a *mixture* of oxide or nitrate of zinc and phosphoric acid, the combination will make a pellet which will retain markedly its *acid* taste for from one to several hours, but if a *neutral cement* or *true combination* is the result, the acid taste will pass away in from thirty minutes to an hour.

I have also completed a long line of experiments for the purpose of obtaining a good *covering* which should take the place of the very useful but not sufficiently durable *varnish*. It is of *decided benefit* that zinc-phosphate cement should have time, from two or three to twenty-four or more hours, to become thoroughly a "cement," and for this purpose I have now a wax composed of one part white wax to five of resin—one to five—which I make by melting together and then working to reasonable whiteness, and drawing out and rolling into little sticks, using powdered soapstone to prevent adhesion to the fingers.

Heat a flat or ball burnisher and with it melt and apply a *thin* covering of wax to the face of the filling. It can be applied easily, and smoothed neatly, and promises a remarkable degree of durability.

Regretting my inability to be with you, and tendering my kindest regards, I am,

Very truly yours,

J. FOSTER FLAGG.

Dr. Bödecker. For my part, I have to thank Dr. Niles for the great trouble he has taken in the study of this subject. He has very nicely pointed out all the different stages of the phosphoric compounds, and, I believe, very correctly. Dr. Niles says, however, that this compound never keeps, or always requires an additional atom of water when in use for any length of time. Theoretically, I know this to be true. But practically, judging from an article which I possess and have used over three years, I know this to be not always

the fact. This is the compound of Poulson's cement, of Hamburg, Germany. A friend sent some bottles of it to me three years ago. With that I filled teeth and built up teeth then which I not long since saw, and they are preserved in a wonderful condition. I am surprised at it myself. This cement even to-day works just the same as it did when I first got it, and I believe it is just as insoluble, because the last year I have used it with great satisfaction in some very bad cases, in very frail teeth, especially one in the front of the mouth, where I disliked to use amalgam and could not well use gold. Theoretically, the powder as well as the liquid absorbs moisture. I must add that my compounds have always stood on the mantelpiece, which always was kept warm by a flue from the kitchen range, and this must have had something to do with the preservation of my filling-material.

Dr. Niles. If protected from air they will keep. I have not seen this cement of Dr. Bödecker's; probably he has kept it from the air and from moisture.

Dr. Rich. These bottles Dr. Bödecker speaks of are very nicely made. I have some at home, and I think they are the same Dr. Bödecker gave or sent to me some years ago. I find, to all appearance, the preparation has not absorbed moisture. I think the thanks of the dental profession are due to Dr. Niles for his investigations in this direction. It is a scientific investigation in this matter, and it will always be found, when there is a change in any material that may be used for such purpose, that there is some cause for it which investigation will develop, and we ought to be glad he has pointed out so very clearly what the cause is. A large number of the cases of failure in the new use of the phosphate of zinc are the result of imperfect preparation, and from the known qualities of both of those articles,—their absorption of moisture from the atmosphere even when it is very dry. I do not apprehend that the place where Dr. Bödecker keeps his powder has anything to do with it. I think it results entirely from the accurate fit of the ground stoppers of the bottles in which it is kept. As an instance of this, in one of the three packages I received from him one of the bottles was cracked when I opened it, and this powder was useless; and there is no doubt it was caused by absorption of moisture. I think we are very much indebted to Dr. Niles for his investigations in this direction. I think the most important part of his paper is the suggestion of having these materials put up in sealed glass tubes; we can thus be sure the article we have used has not absorbed moisture. I think that is the most valuable hint I have heard. The mere packing of the tubes I think is a very valuable hint. Personally, I desire to thank him most heartily for that. I hope Dr. Niles will tell us how these tubes can

be procured, at any cost, because the mere cost would be nothing in comparison to having the material in that shape.

Dr. Niles. I did not study cements to make any money. I am able to fill teeth now with so much more confidence and advantage with this that I am paid for my trouble. I do not have the time to prepare the filling-material. It requires a great deal of apparatus and takes a great deal of attention, and one who has a practice cannot devote his time to it without being paid pretty liberally. I think there may be encouragement for some one to go into its preparation. I have prepared two or three dozen of these boxes to give to my friends. I will leave some of them on the table, and those present can help themselves. In the directions I direct that the cavity be filled more than full. If on the grinding-surface, let the patient close the teeth; in a few days, finish. Some moisture may have been absorbed on the top, possibly. Grind that all off down to the margin of the cavity, and finish as you would finish a gold filling; you have then a smooth surface, which will be kept clean and will wear much better than if left rough. There are but few salts of metals that will stand like the metal itself. The salts of metals are all, with the exception of tin and a few metals which are inert, soluble in acids, and it is impossible to get a plastic material of this kind that will stand like amalgam, unless you take asbestos, silica, or tin, which are inert. We have no acid which will unite with silica to form a stable compound. The stronger acids which I have spoken of have some action upon silica. I powdered some and wet it with the tribasic acid, and, drying it down on my sand-bath, I had a mass as hard as stone. It seems there is a possible action between this acid and silica, with the aid of heat.

Dr. Bronson. What kind of spatula do you use?

Dr. Niles. It is better to use a bone spatula.

Dr. Rich. Has it any action upon horn?

Dr. Niles. I do not think it has. The one I use is nickel-plated. It is not well to use a steel spatula. If used it should not be kept in it very long. One gentleman said he did not like my cement because it "smelt so." He said he used a steel spatula, and he probably got a smell of phosphate of iron.

On motion of Dr. Bödecker, seconded by Dr. Howe, a vote of thanks was passed to Dr. Niles.

Dr. Jarvie. If we could put the results of this paper to some practical use so that we might be benefited in the way of being able to procure the material done up in the air-tight tubes, I think it would be well for us. I have been very much interested in the paper, and anything that will tend to make the oxyphosphate filling more durable, less soluble in the mouth, is exceedingly valuable, for I think

it is one of the nicest plastic preparations we use if we can possibly get it insoluble or nearly so. It adheres to the tooth-substance. The tooth takes kindly to it, and for frail teeth, for children's teeth, and for a large variety of teeth, if it were only insoluble, it would be the nicest filling-material we could possibly have. So, anything that will show us the way to get such is exceedingly valuable to us, and if we could only put the results of the paper to practical use, in the way of getting these tubes prepared, I should like to see it done. Has Dr. Niles made any comparative experiments of the result of the material as kept in this way with the preparation as sold by other manufacturers, putting them to the same tests and under the same circumstances as to the comparative solubility of them?

Dr. Niles. This has been kept some six months, and has not changed at all. It cannot change. The tests that I have made of cements show that they are soluble in water. If you will mix up a mass from some of the packages you have, and drop it in a glass of water, leaving it over night, the next morning the surface will be found quite soft. I have not found that true of this product.

Dr. Lord. I should like to ask Dr. Niles to tell us if he has any plan for putting this material upon the market; if he proposes to make it to any considerable extent himself so that the dentists can procure it, or if he has any plan of putting it in the hands of persons he can rely upon to prepare it for general use.

Dr. Niles. I have talked with several parties about preparing it in quantities, but as yet have come to no conclusion as to what I shall do with it. Those who have called upon me for the preparation I have supplied, and any moderate amount I can continue to supply. Probably it will be placed in the hands of competent persons to prepare and place upon the market in quantities.

Dr. Rich. What will these cost a box, do you suppose?

Dr. Niles. It would not be a very money-making business at four dollars—forty-eight capsules in a box.

Dr. Lord. Then, let us make it an object to make it. We can trust Dr. Niles to give it to us pure. We had better give Dr. Niles five or six dollars, or whatever is sufficient to have him prepare it—whatever price is sufficient so he will find money in it.

Dr. Niles. I thank you for your kind offer, but there are other things which have greater claims on my time than cements hold out at present. I am looking to find some one competent to prepare this under my instruction. If the profession call for it, I will try and have it supplied from reliable sources.

Dr. Jarvie. I want to say a word more in reference to the case I mentioned early in the evening. I have known the lady for ten or twelve years. I have not seen her for five years. Five years ago

the teeth were not in this condition. She tells me she did not observe it until nearly three years ago. It has been increasing since that time. In the lateral incisor, on the lingual surface, I put in a good-sized gold filling. To-day that gold filling is standing at some distance beyond the substance of the tooth that is left. In drawing the model that point of gold was broken off. I have, you will see, left the edge of the metal, proving conclusively there has been a great waste of substance.

Dr. Mills. I have seen the same thing on the grinding surface, and when Dr. Jarvie spoke of the teeth dissolving and leaving the gold filling, I recalled the case of a gentleman whose teeth I have had charge of for a number of years. He had that same action on the molar teeth, and had amalgam fillings that stood up nearly one-eighth of an inch. His teeth were of the densest kind, too.

Dr. Rich. We all have seen that action a number of times. I have a case in my own practice that is interesting,—a young lady who has very finely shaped teeth, and beautifully clear, but the whole labial surface almost down to the cutting-edge is denuded in that way, and the denudation is going on all the time, and the surface is as polished as plate-glass. This process is going on over the whole surface of the superior incisor. I have tried to arrest it. It is becoming a deformity. It commenced in one tooth at a single point, and has made a perfectly smooth surface.

Dr. Jarvie. What do you attribute it to?

Dr. Rich. That is what I want to get at.

Dr. Bödecker. At one of our meetings, I believe over in Brooklyn, this same thing was spoken of, and one of our members, Dr. Howe, then suggested that the living matter in the tooth might have something to do with it. I have thought that all over since. Since then a gentleman came into my hands with teeth as badly deformed in that way as I ever saw. The two centrals had been ground off nearly to the pulp, and were exceedingly sensitive, but they were polished as bright as they could possibly be. By what means? The lateral had gone some distance, but not so much as the centrals, and it was discolored; but I found the pulp was dead. The canine on one side was very badly gone, very near to the pulp, and also very sensitive. On the other side, its fellow was very slightly gone and a little decayed, but there the pulp was dead, too. I asked the gentleman how long since he had noticed the growing out, and he said it had only occurred five or six years since.

Dr. Brockway. Where was the cavity?

Dr. Bödecker. Near the gum; and after the eye-tooth turned black it did not grow out any more. So I believe Dr. Howe's suspicion is rather correct, that the living matter in the tooth has a great deal to do, or as much as may be, with this action.

Dr. Jarvie. It commences in the enamel, but there is little living matter in the enamel.

Dr. Howe. Many have attempted to explain this matter on the chemical theory of the solution of teeth, and I have, for several years, been in the habit of testing for acids and alkalies every case of that nature that came under my observation, and have never been able to discover anything abnormal in the chemical reaction of the mouths where this takes place. On the occasion which Dr. Bödecker refers to, I made this suggestion, it having occurred to my mind in studying different cases of solution of the enamel and dentine that had come under my care, and was gratified not a little at the time I made the suggestion to have Dr. Mills make the statement that he had observed cases in which devitalized teeth had ceased to have this action continued. It seemed to be a confirmation of the theory I had almost adopted at that time. Since then I have seen cases, which I have watched for several years in my own practice, where this process is going on, and I find it is arrested in devitalized teeth; in others it is going on. I believe there were also instances given at the recent meeting of the American Dental Association, where this subject was discussed. In response to a paper read on the subject, one of the members of the Association stated the same fact—that he had observed that the process stopped when the teeth were devitalized. It all seems to be in confirmation of the suggestion that I had the honor to make.

Dr. Rich. Of course, if that were so it would lead us to the same conclusion that Dr. Howe arrived at. I have seen it when it reappeared in devitalized teeth. Yesterday I saw a case where the lower second molar had been devitalized for many years and filled, where this process had gone on until the filling stood out in strong relief on the grinding-surface, and alongside of the filling there was quite a deep pit which I could touch without giving pain, and this pit and all of the surrounding side was brilliant in its polish. It seems to affect the dentine in that condition much more than the enamel. The polish is so perfect that it is almost impossible to attribute it to chemical action, because that is not the mode of chemical action. Of course, we are in a mystery about this matter, all of us. There are all sorts of theories, but it would be quite an important matter if we could discover the cause of this condition of things. I thought I had found the solution in one case where a lady said she had been residing in Florence and had used a great many lemons; and I said, "You must stop the use of lemons." She is a lady fifty-odd years of age. She has abandoned acids, and was very much alarmed when I told her that that caused the destruction of the teeth. That was two years ago.

The fact that this has continued since she has abandoned the use of acids, and has followed my directions about testing the fluids of her mouth with litmus paper and using bicarbonate of potash when there was an acid reaction, seems to point to the conclusion that it is not a chemical action. I have often heard gentlemen say that they could point out the cause of this, and give various conditions of the mouth in which acid might be generated and might not; but investigation oftentimes baffles us, and when any dentist finds he has hit upon that thing, instead of merely asserting it, he should show it to the largest number of dentists he can reach, so that it will be something besides assertion. I have heard gentlemen say—gentlemen of reputation—that they could always correct it. I should like to see it done, and in the future when a dentist says he can remedy a thing of this kind, he should take the case where he has applied the remedy to the largest number of intelligent dentists he can.

Dr. F. Y. Clark. I am very much pleased with this discussion, as in a long life of practice I have been troubled with similar cases, and am pleased with the remarks of Dr. Howe that he has investigated these cases, to be thoroughly convinced, that it does not take place from acid. I would make this suggestion, and I would like to have the gentlemen who are microscopists collect the saliva upon those surfaces, and examine and compare it with the saliva from under the tongue. I have noticed a difference, but what that difference is I am not able to say. I believe the saliva at the margin of the gum has something to do with it. I think an examination of the saliva with the microscope will show a difference between the corpuscles of the saliva there and the corpuscles of the saliva of the lingual surface.

Dr. Jarvie. May I say that the pulp of one of the centrals has been dead for some time, and that the past two weeks I have been treating them for alveolar abscess?

Dr. Brockway. Has the wasting away been subsequent to the death of the pulp?

Dr. Jarvie. That tooth has wasted away more than the tooth with the live pulp.

Dr. Howe. How long has the pulp been dead?

Dr. Jarvie. I could not say. I have not seen the lady for five years. The pulp was not dead five years ago.

Dr. Niles. Do I understand, Dr. Jarvie, that the woman had chronic dyspepsia?

Dr. Jarvie. She has been a severe sufferer for probably five years.

Dr. Niles. Then I should think that the acid of the stomach, being lactic and hydrochloric, would have an effect upon the teeth.

Dr. Jarvie. Will acid leave the surface beautifully polished?

Dr. Niles. Dr. Moffat has a fine specimen where the teeth look like lumps of wax that have been melted by heat applied to the surface. This person had the same trouble.

Dr. Atkinson. I have had considerable to do with teeth under such circumstances. Whenever in filling I have gone to the margin of the cement in such cases, I have never known this form of difficulty to proceed. I could form theories to-day, which I do not care to, but I have stated the facts. I have had a good many patients who were not willing to have the operation made to protect the teeth from this process as early as I advised them, who afterwards either lost their teeth or had the operation made. I never have seen a tooth wasted that way, or any other like it, with the pulp devitalized.

Dr. Rich. As regards this disease, my remedy for arresting it has been filling, and, in corroboration of Dr. Atkinson's remarks, I have found that filling has arrested it. In the case I related to-night filling was the course suggested to the patient, but, as it involved the whole surface, she objected to a filling of that size. I have arrested it in many, many cases by filling, where it has been close to the gum.

Adjourned.

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

The regular meeting of the Odontological Society of Pennsylvania was held Saturday evening, December 3, 1881, at the office of Dr. W. G. A. Bonwill, 1719 Locust street, President Dixon in the chair.

Incidents of Practice.

Dr. Kingsbury. I feel interested in the Richmond crown. Some time ago Dr. Richmond came to my office and inserted a crown for one of my patients, which is doing good service. About two years and a half ago I inserted a modification of a Richmond crown for a patient, using oxyphosphate of zinc. It has stood until the present time. The gentleman was so well pleased that a few days ago he came to have a similar operation performed. The root being in good condition, I inserted a Richmond crown; it required one-half a day for the operation, but it gives promise of durability.

Dr. Essig. Several years ago I filled several large cavities on the grinding-surface with gutta-percha, covering with a piece of pure gold swaged to fit. Every one has been successful. Have seen them every six months for four years. After the cavity is filled with gutta-percha, an impression of it is taken. A piece of pure gold is swaged to fit, a piece of platinum well soldered to it, warmed, and pressed

into the gutta-percha. I have inserted several Richmond crowns. They have done perfectly well, and promise to last years. I use oxy-chloride of zinc.

Dr. Guilford. I have set two gold bicuspid crowns on the Richmond plan, and they are fully equalling my expectations, although each has been worn several years. They were set with oxychloride of zinc. In each case I drilled a small hole, as an air-vent, between the cusps, so that I might have no difficulty from that source in driving them home; it also allowed the surplus cement to escape through it instead of at the neck, which I had taken care to fit very accurately. A day or two afterwards I plugged this vent with foil. I made the crown of medium twenty-two carat gold plate, and built up the cusps with layers of plate and solder in the usual way.

Last summer, in the office of a dentist, I saw a novel method of producing the cusps in a simpler way. The gentleman had taken a half dozen natural bicuspid teeth and imbedded them in a block of plaster, leaving only the cusps and masticating-surface protruding. In the same way he had prepared blocks of various sizes of superior and inferior molars. These he reproduced in zinc and made lead counters for them. After bending his plate to form the body of the crown, he soldered it, and then selecting a crown on his zinc-die to suit it, he struck up a cap which he soldered to the body. This lessened the labor of making and polishing the cusps very considerably.

In regard to the Bing method of attaching a pure gold cap to a gutta-percha filling, the first one I ever saw was made in my laboratory by Dr. Bing, in 1876. He shaped it with the pliers. In the one (only one) I set shortly afterwards, I filled the tooth with gutta-percha, shaping it to fit the antagonizing tooth. I then took an impression of it, made my die and counter and swaged the cap, which was thus sure to fit in every way.

Dr. E. R. Pettit. I have inserted thirty or forty of the Bing caps, all, I believe, in compound cavities, and, so far as I know, a large majority of them have proved failures. They are good only where a good foundation can be obtained, as in other cases the force exercised in mastication when gutta-percha is used will very frequently fracture the weak crowns of these teeth; while if osteoplastic be used it will dissolve out. In a few cases I have been successful with them, but I do not consider them equal to other methods of filling teeth, and I have consequently abandoned their use altogether.

Dr. Darby exhibited specimens of Watts's crystal gold under the microscope.

Dr. Tees filled a large cavity in a molar tooth imbedded in plaster

with Watts's crystal gold. The gold was cut into slabs one-sixteenth of an inch in thickness by means of a razor, and annealed upon a piece of platinum over the small flame of a spirit-lamp. He used points especially adapted for this kind of gold, condensing with the hand-mallet. He has used crystal gold successfully for over ten years, and for the past three years has used no other kind.

Dr. Kingsbury. I used Watts's crystal gold as soon as it was introduced. I can show a filling of crystal gold inserted twenty-five years ago, still bright and beautiful. At that day some batches of it were good and some not. A large number of fillings inserted then are, I suppose, good to-day. But since the various forms of gold foil make equally as good work, I see no great advantage in its use.

Dr. Buckingham. What is the difference in the preparation of cohesive and non-cohesive gold foil? I have asked a number of persons, and have not been able to ascertain.

Dr. Essig. The surface of non-cohesive gold foil is carbonized. Fully cohesive gold is annealed in a blue flame; semi-cohesive in a yellow flame.

Dr. Register. I can make non-cohesive gold cohesive by heating it to almost white heat.

Dr. Buckingham. In regard to the welding of gold in the process of filling, all metals condense gas upon their surfaces; some more than others. Palladium foil condenses, at a temperature below 212 degrees, 643 times its volume of hydrogen; and sponge platinum will become red-hot when hydrogen gas is projected upon it. Gold foil will float upon water, although it is nineteen times heavier. Have tried to weigh a sheet of No. 4 gold foil in water, and found its weight to be about one grain, while it weighed four grains out of the water. The difference in weight is attributed in a great measure to the gas adhering to the gold, which prevents it from cohering.

Adjourned.

SOCIETY OF THE ALUMNI OF THE DENTAL DEPARTMENT OF THE UNIVERSITY OF PENNSYLVANIA.

At the second annual meeting of the Society of the Alumni of the Dental Department of the University of Pennsylvania, held in the Medical Hall, March 15, 1882, the following officers were elected for the ensuing year:

Dr. H. L. Reinecke, president; Dr. E. P. Hawes, first vice-president; Dr. S. L. Wiggins, second vice-president; Dr. T. D. Sinclair, third vice-president; Dr. C. T. Howard, corresponding secretary; Dr. J. H. Campbell, recording secretary and treasurer; Dr. V. M. Smith, orator; Drs. W. H. Barclay, H. L. Morse, H. C. McClure, J. F. Harlan, and J. G. Sharpe, executive committee.

Graduates who wish to join the society can do so by sending their names and addresses to the secretary, and inclosing the yearly dues (one dollar).

J. H. CAMPBELL, *Recording Secretary.*

FIRST DISTRICT DENTAL SOCIETY OF THE STATE OF NEW YORK.

THE fourteenth annual meeting of this society was held in New York City, on Tuesday evening, April 4, 1882. The following were elected officers for the ensuing year:

Dr. A. L. Northrop, president; Dr. Wm. T. LaRoche, vice-president; Dr. James E. Dexter, secretary; Dr. Charles Miller, treasurer; Drs. A. L. Northrop, W. A. Bronson, E. A. Bogue, Frank Abbott, C. A. Woodward, censors.

JAMES E. DEXTER, *Secretary,*
No. 8 East 34th St., New York City.

CHICAGO DENTAL SOCIETY.

THE annual meeting of the Chicago Dental Society was held on the evening of April 4, 1882.

The following officers were elected for the ensuing year: E. S. Talbot, president; Frank H. Gardiner, first vice-president; A. W. Hoyt, second vice-president; H. F. Kimball, recording secretary; A. W. Harlan, corresponding secretary; E. D. Swain, treasurer; Jos. G. Reid, librarian; George H. Cushing, J. N. Crouse, Edmund Noyes, board of directors.

A. W. HARLAN, *Corresponding Secretary*, Chicago.

UNIVERSITY OF MICHIGAN—DENTAL DEPARTMENT.

THE seventh annual commencement of the College of Dental Surgery of the University of Michigan took place in the Hall of the University, Ann Arbor, Mich., on Wednesday, March 29, 1882, at 2.30 o'clock P.M.

The address to the Class was delivered by George Watt, M.D., D.D.S.

The number of matriculates for the session was seventy-six.

The degree of D.D.S. was conferred upon the following graduates:

George Post Ashton..........Missouri.
Wellington B. Banks.........Michigan.
Frederick J. Barnes..........Ohio.
Fred Thompson Bell.........Illinois.
James Christopher Bush...Kentucky.
Wesley John Campbell.....New York.

Jennie Marietta Clark......Wisconsin.
Charles Elbert Cleveland...Illinois.
Edward Carroll Condict....New Jersey.
Herbert Lee Davis............Ohio.
Bernard John DeVries......Holland.
Charles Albert Eckert.......Ohio.
Margaret Humphreys.......Ohio.
Henry Atherton Knight...Minnesota.
Joseph Bonnell Little.......Wisconsin.
Harry M. Loughridge.......Ohio.
Julien Wellington Lyon...Ohio.
Hattie Lovina Martindale..Michigan.
Kate Cameron Moody......Illinois.
Frank Scott Morrison.......Ohio.
Edward Morgan Nutting...New York.
Romeyn Melvin Paine......Michigan.
Charles Francis Porter......Michigan.
Wm. Henry Priestman.....Illinois.
Joseph Lee Rose..............Alabama.
Walter Irving Southerton.Michigan.
Edmund Pease Stiles........Texas.
Wilber Andrew Studley....New York.
Robley Owen Sturgeon......Ohio.
Harry Bryant Tileston......Indiana.
William A. B. Treadway...Connecticut.
James Marrion Welch......Maryland.

NATIONAL DENTAL ASSOCIATION OF THE UNITED STATES OF AMERICA.

The next annual meeting of the National Dental Association of the United States of America will be held in the City of Washington, D. C., commencing on Thursday, August 3, 1882.

The meetings of the Association held in Washington being *international*, members of the profession residing and practicing in foreign countries are cordially invited to be present.

R. Finley Hunt, *Secretary*, Washington, D. C.

THE AMERICAN DENTAL CONVENTION.

The American Dental Convention will hold its twenty-sixth annual session in the Town Hall, Saratoga Springs, on the second Tuesday in August, 1882. Ample provision will be made for the accommodation of members; also, for the exhibition of materials, etc. Further particulars will be given in the July number of the Dental Cosmos.

Any communication relative to said meeting addressed to Dr. A. C. Rich, Saratoga; Dr. H. Townsend, 1514 Vine Street, Philadelphia; or Dr. J. G. Ambler, No. 5 West 22d Street, New York, will meet with prompt attention.

On behalf of the Committee of Arrangements,

J. G. Ambler, *Chairman*.

AMERICAN MEDICAL ASSOCIATION—SECTION ON DENTISTRY.

The thirty-third annual meeting of the American Medical Association will be held at St. Paul, Minnesota, commencing June 6th, and lasting four days. A section on *dentistry* was formed in this association at its last meeting, and medically-educated dentists were recognized as specialists in medical science. All medical men of the

regular school practicing the specialty of dental surgery are most cordially invited to procure credentials from their local medical societies, and join us at St. Paul. All railroads furnish reduced rates to all members wishing to attend.

"A member desiring to read a paper before any section should forward the paper, or its title and length (not to exceed twenty minutes in reading), to the Chairman of the Committee of Arrangements, at least one month before the meeting."—(BY-LAWS).

TRUMAN W. BROPHY,
Secretary Section on Dentistry, American Med. Association.

ILLINOIS STATE DENTAL SOCIETY.

THE eighteenth annual meeting of the Illinois State Dental Society will be held at Quincy, on the second Tuesday (9th) of May, and will continue four days.

The dentists of Illinois and the neighboring States are cordially invited to be present.

EDMUND NOYES, *Secretary.*

The Illinois State Board of Dental Examiners will meet at the Tremont House, Quincy, Illinois, on Saturday, May 6, 1882, for the purpose of examining those wishing license.

The law requires that every dentist having commenced practice in Illinois after July 1, 1881, shall obtain license, unless he holds a diploma from some reputable dental college.

GEORGE H. CUSHING, *Secretary.*

EDITORIAL.

DENTISTRY IN SOUTHERN AFRICA.

PETITIONS from leading members of the dental, medical, pharmaceutical, legal, and other professions of Cape Town and the chief centers of population of Cape Colony, Africa, have been presented to the Governor, asking protection by act of Parliament against unqualified dentists. The petitioners recite that since the introduction of anesthetics for operations in dental surgery, and the employment of powerful drugs in the treatment of cases of dental pathology, suitable study and qualification should be demanded, and ask that persons practicing dentistry be required to obtain the government license certifying to their proper fitness to perform the duties of dental surgeons. The petitions were also signed by many members of the Colonial Parliament.

SUITS AGAINST DENTISTS.

In the New York Marine Court, before Judge Hall, suit was recently brought by Mr. Thomas J. Kelly against Drs. G. Q. Colton and L. M. Slocum, for carelessness in permitting an accident to happen to the complainant during the extraction of a tooth while under the influence of nitrous oxide. The tooth, which was the first molar on the right side of the inferior maxilla, was extracted by Dr. Slocum. The complaint set forth that it was by the "advice and direction" of the defendants that the gas was administered; that the operation was performed so carelessly as to allow a fragment of the tooth to slip from the forceps and pass into and lodge in the trachea; that great pain and irritation resulted from festering, and that the patient suffered many days from sickness, and was at much expense for medical treatment. (The fragment of tooth was thrown out after many severe paroxysms of coughing.) The answer of the defendants was that it was beyond their control or power to prevent the accident, and that the use of the gas in no way assisted or aided thereto; that when the greatest care and diligence are used teeth will slip from the forceps; and that the plaintiff failed to notify them within a reasonable time after the tooth was extracted in order that they might remove the fragment.

After the hearing of considerable evidence pro and con, during which testimony was introduced by the complainant to show that the forceps slipped when the tooth was extracted, and that the defendant hurriedly performed the operation, and, on the part of the defense, that such an accident was liable to occur with the greatest care, the jury rendered a verdict which gave the plaintiff $500 damages. The defendants will appeal the case. Mr. Edward P. Wilder appeared for the plaintiff, and Mr. Theodore E. Tomlinson for the defendant.

The following is the rule of liabilities of dentists as laid down by Judge McArthur in the recent case, in Washington City, of William Joice *vs.* E. P. Howland and S. T. Mason—Howland Dental Association—for injury done him in the extracting of his teeth.

"If the jury find from the evidence that the defendants held themselves out to the public as dentists, and in that capacity undertook for compensation to extract certain teeth of the plaintiff, they implied, engaged, and were bound to use such reasonable skill, diligence, and care, both in the extraction of said teeth and in the subsequent arrest and treatment of any hemorrhage or other injury occasioned thereby, as is ordinarily possessed and exercised by dentists well educated in their profession, and if there was any want of any such diligence, care, and skill upon the part of said defendants, or either of them, and the plaintiff suffered injury therefrom, he is entitled to recover. And in that case their verdict should be for the

plaintiff, in such sum as they shall think will be just and adequate compensation to him for such bodily and mental suffering and permanent inconvenience and injury, if any, as they shall find he has suffered through such default of the defendants."

The jury found for the plaintiff; verdict, $250 damages.

DENTAL LEGISLATION IN IOWA.

IOWA has been added to the roll of States which have passed enactments regulating the practice of dentistry. The text of the bill which became a law March 2, 1882, is given below:

"A BILL FOR AN ACT TO INSURE THE BETTER EDUCATION OF PRACTITIONERS OF DENTISTRY IN THE STATE OF IOWA.

"*Be it enacted by the General Assembly of the State of Iowa*:

"SECTION 1. That it shall be unlawful for any person who is not at the time of the passage of this act engaged in the practice of dentistry in the State to commence such practice, unless such person shall have received a license from the Board of Examiners, or some member thereof as hereinafter provided, or a diploma from the faculty of some reputable dental college, duly authorized by the laws of the State, or by some other of the United States, or by the laws of some foreign country, in which college or colleges there was at the time of the issue of such diploma annually delivered a full course of lectures and instruction in dental surgery.

"SEC. 2. A Board of Examiners is hereby created, whose duty it shall be to carry out the purpose and enforce the provisions of this act. The members of such board shall be appointed by the Governor, and shall consist of five practicing dentists, who shall have been engaged in the continuous practice of dentistry in the State for five years or over, at the time of, or prior to, the passage of this act. The term for which the members of said board shall hold their office shall be five years, *except* that the members of the board first appointed under this act shall hold their office for the term of one, two, three, four, and five years respectively, and until their successors shall be duly appointed. In case of vacancy occurring in said board, such vacancy shall be filled by the Governor.

"SEC. 3. Said board shall choose one of its members president and one the secretary thereof; and it shall meet at least once in each year, and as much oftener, and at such time and place as it may deem necessary. A majority of said board shall at all times constitute a quorum, and the proceedings thereof shall at all reasonable time be open to public inspection.

"SEC. 4. It shall be the duty of every person who is engaged in the practice of dentistry in the State, within six months from the date of the taking effect of this act, to cause his or her name and residence, or place of business, to be registered with the said Board of Examiners, who shall keep a book for that purpose; and every person who shall so register with said board as a practitioner of dentistry, may continue to practice the same as such without incurring any of the liabilities or penalties of this act.

"Sec. 5. No person whose name is not registered on the books of said board as a regular practitioner of dentistry, within the limits prescribed in the preceding section, shall be permitted to practice dentistry in this State until such person shall have been duly examined by said board, and regularly licensed in accordance with the provisions of this act.

"Sec. 6. Any and all persons, who shall so desire, may appear before said board at any of its regular meetings, and be examined with reference to their knowledge and skill in dental surgery, and if such person shall be found, after having been so examined, to possess the requisite qualifications, said board shall issue a license to such person to practice dentistry in accordance with the provisions of this act. But said board shall at all times issue a license to any regular graduate of any reputable dental college, without examination, upon the payment by uch graduate to the said board of a fee of one dollar. All licenses issued by said board shall be signed by the members thereof, and be attested by its president and secretary; and such license shall be *prima facie* evidence of the right of the holder to practice dentistry in the State of Iowa.

"Sec. 7. Any member of said board shall issue a temporary license to any applicant, upon the presentation by such applicant of the evidence of the necessary qualification to practice dentistry; and such temporary license shall remain in force until the next regular meeting of said board occuring after the date of such temporary license, and no longer.

"Sec. 8. Any person who shall violate any of the provisions of this act shall be liable to prosecution, before any court of competent jurisdiction, upon information, and upon conviction shall be fined not less than twenty-five dollars nor more than fifty dollars for each and every offense.

"Sec. 9. In order to provide the means for carrying out and maintaining the provisions of this act, the said Board of Examiners may charge each person, applying to or appearing before them for examination for license to practice dentistry, a fee of two dollars; and out of the funds coming into the possession of the board from the fee so charged the members of said board may receive, as compensation, the sum of five dollars for each day actually engaged in the duties of their office. And no part of the salary or other expenses of the board shall be paid out of the State Treasury. All moneys received in excess of said *per diem* allowance shall be held by the secretary of said board as a special fund for meeting the expenses of said board, he giving such bond as the board shall from time to time direct. The said board shall make an annual report of its proceedings to the Governor by the fifteenth of November of each year, together with an account of all moneys received and disbursed by them pursuant to this act.

"Sec. 10. Any person who shall be licensed by said board to practice dentistry shall cause his or her license to be registered with the County Clerk of any county or counties in which such person may desire to engage in the practice of dentistry; and the County Clerks of the several counties in the State shall charge for registering such license a fee of twenty-five cents for each registration. Any failure, neglect, or refusal on the part of any person holding such license to register the same with the County Clerk as above directed, for a period of six months, shall work a forfeiture of the license; and no license, when once forfeited, shall be restored, except upon the payment to the said Board of Examiners of the sum of twenty-five dollars, as a penalty for such neglect, failure, or refusal.

"Sec. 11. Nothing in this act shall be construed to prevent persons from extracting teeth.

BIBLIOGRAPHICAL.

A Manual of Dental Surgery and Pathology. By Alfred Coleman, F.R.C.S., L.D.S., etc. Thoroughly Revised and Adapted to the Use of American Students and Practitioners. By Thomas C. Stellwagen, M.D., D.D.S. Philadelphia: Henry C. Lea's Son & Co., 1882. Price, cloth, $3.25.

This volume presents a highly creditable appearance, and deserves to rank among the most important of recent contributions to dental literature. The topics, arranged in twenty-three chapters, embrace first and second dentition, injuries to the teeth, caries, selection of instruments, treatment of caries, periodontitis, necrosis, artificial crowns, extraction, anesthesia, replantation and transplantation, diseases of the gums, jaws and antrum, affections dependent upon dental irritation, etc. Noticing first the deficiencies of the work, its value as a text-book would have been enhanced by a more comprehensive consideration of some of the subjects treated. For example, the management and use of the electro-magnetic mallet, an instrument under certain circumstances almost indispensable, and which, undoubtedly, occupies an important place in operative dentistry, scarcely receives mention.

Restoration of contour in filling teeth is passed with merely incidental notice, and that of a somewhat deprecatory nature.

Whatever general objection may be urged against protracted operations in the building up of gold for the restoration of the anatomical form of the tooth, there are doubtless few operators who have not been compelled to resort to that plan in order to close so-called "permanent separations," the existence of which constituted sources of intolerable discomfort to the patient. In addition to this, it cannot be denied that very beautiful and durable fillings on the contour plan can be made by operators possessing the requisite amount of skill. These facts would seem to fairly entitle this mode of practice to a place among the valuable methods in the treatment of carious teeth. The chapter on "fitting artificial crowns to roots of natural teeth" (by the American editor), although a valuable addition to the work, might, with advantage, have been made to include other approved methods of forming and attaching artificial crowns.

It is also to be regretted that under the general heading of periodontitis no attempt has been made to classify causes, or to define the signs which enable the practitioner to establish a correct diagnosis. There is probably no part of dental surgery of more importance to students than this, and there is certainly no branch of practice in

which they manifest greater interest. Before any effective line of treatment can be employed, a satisfactory solution of such queries as the following must be arrived at: First, which tooth is affected? Second, is the trouble due to periodontitis or to irritation of a living pulp? And if periodontitis, is the pulp alive or dead? Periodontitis, with the usual phenomena, frequently occurs in certain stages of pyorrhœa alveolaris, where the pulp is in a state of full vitality. Differential diagnosis is not always easy in such cases, and a most instructive and interesting chapter on that subject might have been added to the work.

In the conservative treatment of the pulp, under the head of "capping," the use of chips or powder from the healthy dentine of the tooth to be treated, made by scraping from the walls of the cavity towards the point of exposure, so that the pulp may receive a covering of the powdered dentine, is based on the principle of skin-grafting. At best, the arguments employed in favor of such treatment do not tend to establish any degree of superiority for it as a "capping," and in the absence of a report of results attained by its employment, it remains a mere suggestion. The use of arsenious acid, recommended on page 248 as an antiseptic agent in devitalized teeth, is not likely to meet with much favor, as there are many other equally effective and much less dangerous remedies.

Mr. Coleman has presented his methods of practice, for the most part, in a plain and concise manner, and the work of the American editor has been conscientiously performed. He has evidently labored to present his convictions of the best modes of practice for the instruction of those commencing a professional career, and, while it would not be difficult to criticise, it must be said in all fairness that he has faithfully endeavored to teach to others all that he has acquired by his own observation and experience. As a whole, the book will compare favorably with other recent works on dental surgery, and it deserves a place in the library of every dentist.

C. J. E.

OBITUARY.

JAMES CHANDLER, M.D.

Died, at Syracuse, N. Y., April 17, 1882, James Chandler, M.D., aged eighty-two years.

Dr. Chandler was one of the pioneers in dentistry, having been in practice about fifty years—first in the city of Schenectady, N. Y., then removing to Syracuse, where he remained in active practice until about six years ago, when he retired.

PERISCOPE.

Irregular Dentition.—Here is a case which I have brought before you because it gives me an opportunity to say something to you about irregularities of dentition. This child is eleven weeks old, yet it has two molar teeth which were noticed before it was five weeks old. The mother says that she noticed the first molar tooth before the child was one month old. It appeared in the left upper maxilla, and the day afterwards another molar tooth was found to exist opposite in the lower jaw. This is a very peculiar history. There is nothing else the matter with the child, the mother says, and all her other children are in a normal and healthy condition. Now, you know it is very uncommon to find molar teeth developing as early as they probably have in this case. Teeth will usually appear about the seventh or eight month, but then it is the *lower* central incisors. You remember in the case of premature cranial ossification, which we had the other day, I made the point that it was the upper central incisors which had appeared first, there being a closer connection between the skull and upper jaw than the skull and lower jaw. Here the appearance of teeth at all, at so early an age, is quite abnormal, and it is probable that they were there before the mother noticed them. They may and probably have been congenital. Congenital teeth are very small, and occur very rarely. I, myself, as I am in an exceptionally favorable position to observe such anomaly, have met with that anomaly perhaps twenty times. This is quite an unusual number, for there is many a practitioner who never met with a case. But a congenital molar tooth I have never seen, nor do I know of any that has been reported. There have been many cases of congenital teeth recorded, probably because of their rarity, and the history of congenital teeth is very old. Pliny, the younger, states that the celebrated Marcus Curius, consul of the Roman Republic two hundred and seventy years before our era, had a full set of teeth at birth. This was the reason of his being named Dentatus. The same author mentions two other instances of children who had their teeth at birth. Zoroaster, the Persian legislator, is reported to have had all his teeth at birth. Louis the Fourteenth, of France, was born with two teeth, as was also his secretary of state, Cardinal Mazarin. Richard the Third, of England, and Mirabeau both had congenital teeth. Haller has collected a list of nineteen cases of congenital teeth, and there are many other instances of this abnormality besides these which I have mentioned to you, which are recorded both in ancient and modern literature. The journals of the last ten years continue to give a number of such cases. These congenital teeth are usually small, ill-shaped, and have no root. They only hang in the gums. They differ from genuine teeth in that they are less firm and solid, their enamel is thin, and not formed at all in some places, and they are not inclosed in the dental alveolus. Such teeth often prevent the child from nursing, and cause the nipples of the mother to become very sore. They should then be removed, which can be done without difficulty. Often an ordinary dressing-forceps will be sufficient for the purpose, or they may even be detached by the finger. When such teeth are removed, the real

deciduous teeth, as a rule, appear afterwards. In a number of cases which I have followed up new temporary teeth have appeared, although it has been stated, erroneously, that no temporary teeth would appear at all previous to the eruption of the permanent teeth. These congenital teeth seem to be entirely supernumerary, and I regard them as an accidental connective-tissue formation. The upper tooth here is too firm to justify an attempt to remove it at present. The lower molar I was able to remove with my finger. There is one fact about congenital or abnormal teeth which it is important that I should mention. The children are often not in good health. They are cases in which rachitis develops at a later period, and may usually be considered a symptom of a morbid constitution, which will require anti-rachitical or anti-scrofulous treatment for its repair. It is then an anomaly which is by no means welcome. Premature dentition, premature walking, and premature ossification of the cranial bones usually coexist.

Another variation in the appearance of teeth is their eruption at a period later than the normal one. One case is on record where a girl got her four temporary teeth when thirteen years old; another where a child of five or six years had only a few incisors; and there is a case reported by Smellie where the first tooth appeared in the twenty-second year of life. There is a very small number of cases in which the entire absence of teeth has been noted; also where certain of the teeth have been absent. Storch describes the case of his own daughter, who had no canine teeth, and I myself have seen a lady with but two upper incisors, and lately a few children in the same family with the same anomaly. The molar I present here is very flat, its surface large enough, its depth very trifling; it shows four little prominences representing the diminutive roots. If you care to read more on the subject, I refer you to my "Dentition and its Derangement," New York, 1862, or the *American Medical Times* of that year.—*Extract from a Clinical Lecture by Prof. Jacobi.*

On the Origin of Dental Caries, Constitutional and Local.—Dr. B. W. Richardson, F.R.S., read the paper of the evening on the "Origin of Dental Caries, Constitutional and Local." The present widespread prevalence of caries was, he said, a matter of more than mere professional—it was of national importance. For some years past he had noted on his clinical records the condition of the teeth of the patients who came before him, and the result of these inquiries had astonished him not a little. He found that of over 4000 persons of both sexes, and of all ages, over eighty per cent. were affected more or less severely with dental caries, while it was rare to meet with a person in whom both sets of teeth were altogether free from the disease. He believed also that it was now more prevalent among the young than it was twenty-two years ago, when he first commenced medical practice. For such a general development of disease general causes must be looked for, and there were two such which he believed to be of chief importance, viz., hereditary syphilis and dyspepsia. With regard to the first, he quoted the statements of Professor Gross and Dr. Holland respecting the proportion of the adult population in the United States and in Great Britain respectively who acquired the primary disease, estimated in each case at about

one in eight. Contracted in adult life, syphilis did not materially affect the teeth, but the hereditary constitution left by it was undoubtedly indicated in the next generation by disease of the teeth and by a constitutional condition in which caries was readily developed. It was hard to say whether dyspepsia should be placed before or after syphilis in point of importance. The form of the disease which produced the greatest amount of evil was that which was induced in the first months of life by improper feeding. In children who were deprived of their natural food, the tissues generally were imperfectly constructed; and although, in the case of tissues which were constantly undergoing reconstruction, some of this harm might be redeemed, in the case of such structures as the teeth, made for the whole of life in a few short months, perfection was impossible if the start was bad. Dr. Richardson did not think that the strumous or tuberculous diatheses caused of themselves any marked tendency to caries; nor did he find that the epidemic diseases of children had any such effect. Passing on to speak of local causes, he mentioned four, viz., the action of heated fluids taken into the mouth, the action of acids upon the teeth, deficient cleanliness of the teeth, and exposure of the teeth to the action of certain chemical substances during work at some special occupations. He believed, however, that these causes were comparatively of slight importance, that caries was rarely of purely local origin, though when there was a low state of nutrition within the tooth, very slight external causes, acting physically or chemically, would produce rapid results. In conclusion, he urged upon the dental profession the importance of impressing upon all with whom they came in contact the necessity of leading a more natural life if they wished to exorcise the terrible disease which was demoralizing civilized humanity, and of assisting to promulgate the natural law that it was the duty of every mother, of whatever rank, to nurse her child, and gradually to lead its vital steps into healthy independent existence.

A prolonged discussion followed.—*Reports Odontological Society of Great Britain, in Medical Times and Gazette.*

Extraction of Teeth in Pregnant Women.—At a recent meeting of the St. Louis Medical Society (St. Louis *Medical and Surgical Journal*) this subject was under discussion. Dr. Borck asked, "Is it advisable to allow the extraction of a tooth or of teeth in a woman who is pregnant? I have been several times asked this question by dentists. Some eminent dentists are afraid to extract an aching tooth in a pregnant woman, lest it may cause abortion."

Dr. Green said that it does not necessarily produce abortion. Of course, there may be cases where such an effect would follow, but if the woman is suffering, and cannot be relieved by any other means, he would recommend the extraction of the tooth.

Dr. McPheeters said that there is a form of toothache which is sometimes a symptom of pregnancy. The teeth are sound, and, of course, it would do no good to extract them. He would not hesitate to advise the extraction of a carious tooth.

Dr. Hughes said, "Some patients, when pregnant, are extremely hyperesthetic; the hyperesthesia extends to the branches of the

fifth pair. Other women, who are more or less nervous when not carrying a child, seem to possess more nerve then than at any other time. I do not know, in view of the varying and variable physiological condition in which we find women in the pregnant state, that we could arrive at any definite rule applicable to all cases. It is simply a question of individual temperaments, of condition of the patient, and of the existence of centric or eccentric irritation; the existence or non-existence of central or peripheral irritation. And, if a pregnant woman is extremely hyperesthetic, and you can find a focus of origin for it in the peripheral irritation of a decayed tooth, there would be no impropriety, in the majority of cases, I apprehend, in the removal of that decayed tooth. If in a condition of general nervous excitation, especially if centered in the brain or cord you have any form of spasmodic display, and you find a possible peripheral source of the irritation, I think the general sentiment of the profession would concur in the propriety of removing that possible source of peripheral irritation."

Dr. Jonaston said, "Some years ago I was called to a lady who had been married six or eight weeks. The second left molar was decayed and an abscess was forming, and protruded from the root of the tooth. The abscess was painful, and I advised opening it. She consented, and I took my lancet and opened the abscess. This produced a tremendous shock, and in 24 hours she aborted. This case occurring in my early practice has made me very careful about extracting a tooth from a patient during the early part of pregnancy if she be of a nervous temperament; it is hazardous practice. But if the toothache continues, the reflex irritation of the pneumogastric nerve, connecting with the great sympathetic, may induce uterine contraction, and cause the woman to abort. In such a case we should recommend that the tooth be pulled. There is no rule in the practice of medicine; and no rule as regards drugs, except castor oil. I have given calomel for 20 years, under the supposition that it acted on the liver, and now we are told that it doesn't act upon the liver at all."

Dr. Hurt closed the discussion by saying, "I think we are all obliged to concede the possibility of the extraction of a tooth during pregnancy producing abortion under certain conditions. There is no doubt, also, that there are circumstances under which the extraction of a tooth during pregnancy ought to be advised. The loss of a sound tooth ought not to be allowed, unless something is going to be accomplished by it that cannot be accomplished otherwise. But I would have no hesitation about advising the extraction of a tooth from a pregnant woman if it was absolutely necessary to relieve her from a distressing, harrassing pain that was wearing her out; and in doing this we may administer an anesthetic without interfering in the least with the pregnancy. When she is under chloroform or ether we obviate the shock which is usually attendant upon the extraction of teeth. And experience has taught that pregnant women are very tolerant of these agents."—*Medical and Surgical Reporter.*

Hygiene of the teeth.—A hard crust is the best possible dentifrice. I never could get myself to believe in the natural necessity of a tooth-brush. The African nations, the Hindoos, the natives of

Southern Europe, the South Sea Islanders, the Arabs, the South American vegetarians—in short, three-fourths of our fellow-men, besides our next relatives, the frugiverous animals, have splendid teeth without sozodont. I really believe that ours decay from sheer disuse; the boarding-house *homo* lives chiefly on pap—wants all his meats soft-boiled, and growls at cold biscuit or an underdone potato; in other words, he delegates to the cook the proper functions of his teeth. We hear occasionally of old men getting a second, or rather third, set of teeth. I met one of them in northern Guatemala, and ascertained that he had become toothless during a twelve years' sojourn in a seaport town, and that he got his new set upon his return to his native village, where circumstances obliged him to resume the hard corn-cake diet of his boyhood years. His teeth had reappeared as soon as their services were called for, and would probably never have absented themselves if a pap diet had not made them superfluous. An artificial dentifrice will certainly keep the teeth white, but that does not prevent their premature decay; disuse gradually softens their substance, till one fine day the hash-eater snaps his best incisor upon an unexpected piece of bone. Every old dentist knows hundreds of city customers whom the daily use of a tooth-brush did not save from the necessity of applying, before the end of the fortieth year, for a complete "celluloid set." I do not say that a soft tooth-brush and such dentifrices as oatmeal or burned arrow-root can do any harm, but for sanitary purposes such precautions must be supplemented by *dental exercise.* Let a child invigorate its teeth by chewing a hard crust, or, better yet, a handful of "St. John's bread," or carob-beans, the edible pod of the Mimosa siliqua. Children and whole tribes of the northern races seem to feel an instinctive desire to exercise their teeth upon some solid substance, as pet squirrels will gnaw the furniture if you give them nut-kernels instead of nuts. Thus, Kohl tells us that the natives of southern Russia are addicted to the practice of chewing a vegetable product which he at first supposed to be pumpkin or melon seeds, but found to be the much harder seed of the Turkish sunflower (Helianthus perennis). Their national diet consists of milk *kukuruz* (hominy, with butter, etc.) and boiled mutton, and they seem to feel that their Turkoman jaws need something more substantial. The schoolboy habit of gnawing penholders, finger-nails, etc., may have a similar significance. The Mimosa siliqua would yield abundantly in our Southern States, and its sweet pods would make an excellent substitute for chewing-gum. Our practice of sipping ice-cold and steaming-hot drinks, turn about, has also a very injurious effect upon the brittle substance that forms the enamel of our teeth; no porcelain glaze would stand such abuse for any length of time, and experience has taught hunters and dog-fanciers that it destroys even the bone-crushing fangs of the animal from which our canine teeth derive their name.—*Dr. Felix L. Oswald, in Popular Science Monthly.*

Case of Diffused Tuberculosis of the Buccal Mucous Membrane.—Dr. J. Eichhoff (*Deutsche Med. Wochens.*, 1881, p. 413) gives full notes of the case of a man of 30, thin and poorly nourished, with a greatly enlarged under lip hanging out so that the mouth

could not be closed. Thin saliva continually dripped out. The surface of the under lip was uneven and rough, and covered with tough mucus. In the center could be seen, at the junction of the lip with the gum, a transverse ulcer of about two and a half centimeters' breadth, with smooth, gray-coated surface, and slightly irregular, sharply defined borders. At the right commissure of the lips, on the mucous membrane, a roundish, coin-sized ulcer could be seen, with smooth, grayish surface and somewhat overhanging borders. A similar ulcer could also be found on the right side of the mucous surface of the upper lip. The upper lip itself was much swollen, rough, and covered with mucous masses. The teeth were defective. The tongue was markedly swollen, especially in its anterior and lateral portion. There were a number of pin-head-sized yellowish deposits scattered over the mucous membrane of the tongue, together with several small ulcers. On the tip of the tongue was a flat, yellowish ulcer, and along its border several elongated cicatrices. Several small ulcers could also be observed in the mucous membrane of the hard palate.

The external cutaneous surface showed a number of typical tuberculous ulcers. Physical examination of the chest showed involvement of the lungs. The patient died within a few weeks, when the lungs were found pneumonic and filled with caseous deposits. The upper air-passages were the seat of similar ulcers to those found in the mouth. Likewise the intestine was studded with ulcers, and tuberculous adhesive peritonitis existed. Syphilis was carefully excluded, and the case was evidently one of marked tuberculosis.—*Philadelphia Medical Times.*

What is Resorcin?—Resorcin, says the *Journal of Chemistry*, belongs to a class of bodies called phénols, to which carbolic acid also belongs. In chemical composition they resemble alcohols. Pyrogalic acid is a triatomic phénol. Resorcin was originally obtained by fusing certain resins, as gum ammoniacum or galbanum, with caustic potash, extracting it from the fused mass by acidifying with sulphuric acid and shaking with ether, and then purifying it by distillation. Resorcin crystallizes in colorless plates or columns, and dissolves readily in water, alcohol, and ether. It melts at 104° Cent. (219° F.), and boils at 271° Cent. (520° F.), and can be obtained perfectly pure by distillation. Resorcin is not poisonous in moderate doses. From 25 to 30 grains is required to produce any marked effects. It has been found to reduce the temperature in febrile complaints, but its effect is of short duration, and unpleasant after-effects have been noticed. One of its isomers—hydro-chinone—is preferred for use in fevers, the dose being smaller. The third isomer—pyro-catechine—has powerful toxic properties. Andeer has recently investigated the properties of resorcin, and finds that it possesses the power of stopping decay. A 1-per-cent. solution of chemically-pure resorcin will stop the development of fungi and mold. In every degree of concentration it coagulates albumen and precipitates it from solution, on which account it may be used as a caustic to remove unhealthy tissue. In crystals it cauterizes as powerfully as lunar caustic. In minute quantities resorcin will preserve ink and colors, which would otherwise mold quickly, and does not injure the color.

To stop fermentation completely requires a rather strong solution of one and a half to two per cent. Dr. Koller prophesies a great future for resorcin, which, he says, will be the disinfectant and antiseptic of the physician, the druggist, and the chemist.—*Mississippi Valley Medical Monthly.*

Alveolar Periostitis in Diabetes Mellitus.—Mr. Henry Sewill called attention to a communication recently made by Dr. Magitot to the French Académie de Médicine, in which he stated that alveolar periostitis was always met with in the mouths of patients suffering from diabetes mellitus, and was therefore of great assistance in forming a diagnosis of that disease. He had himself met with two cases which appeared to bear out the correctness of this observation, and he should be glad to hear if others had met with the same experience. He also mentioned the case of a young gentleman who consulted him about a small cavity in an upper molar. While Mr. Sewill was preparing the cavity for stopping, the patient had two short but distinct epileptic attacks. Mr. Sewill remarked that the nature of these attacks in the early stages of epilepsy was often unrecognized by the patient and his friends, and it was therefore the duty of any practitioner who might observe them to give timely warning of their true import.—*Reports Odontological Society of Great Britain.*

Poisoning by Arsenical Paste.—Among other "casual communications," Mr. W. E. Harding, of Shrewsbury, related a remarkable case of poisoning by arsenical paste. A lady came to him complaining of acute pain in a lower molar. Finding the pulp exposed, Mr. Harding applied a small quantity of a preparation known as Baldock's nerve-killing paste, closing the cavity with cotton-wool and sandarac. Within a few hours the patient was seized with symptoms of poisoning by arsenic—burning pain at the epigastrium, vomiting, etc.,—and a rash appeared resembling measles, but slightly raised, and which was followed by desquamation. The stopping was at once removed, but the patient was very ill for several days, and did not altogether regain her health for a fortnight. A remarkable feature in the case was that this lady had suffered in the same way three times previously: once from arsenic used by another dentist, and twice from prescriptions containing it ordered by medical practitioners.

The president remarked that it was very important that patients who were the subject of such idiosyncrasies should mention them when they came to a stranger for treatment; and any practitioner discovering such peculiarities should impress upon the patient the necessity of doing this.—*Reports Odontological Society of Great Britain, in Med. Times and Gazette.*

The Poison of Human Saliva.—Recent observations by M. Gautier (communicated to the Paris Académie de Médicine) afford reason for believing that the poison of serpents differs from human saliva in the intensity of its effects rather than in essential nature, so that the fears with which a human bite is often regarded may not be wholly unreasonable. M. Gautier took some 20 grammes of human

saliva, and, after lixiviating and purifying, obtained a substance which, injected in the form of solution under the skin of a bird, had remarkable toxical effects. Almost immediately the bird was seized with trembling. It staggered and fell to the ground in a state of coma and complete stupor, terminated by death in half an hour or an hour, according to the dose injected and the vigor of the bird. The phenomena resembled fully those produced by the bite of a venomous serpent. The poisonous matter of the saliva is thought to be an alkaloid similar to the cadaveric poisons called *ptomaines*, which MM. Brouardel and Boutmy have isolated. Like them, it produces Prussian blue when mixed with ferrocyanide of potassium. The facts stated throw some light on the question of virulent maladies. The present case, it is pointed out, is not that of a true virus: for at high temperature a virus is destroyed, but when the salivary alkaloid is heated to more than 100° its poisonous property is not affected. M. Gautier studied comparatively the poison of the cobra (one of the most formidable of Indian serpents). This injected in a dose of one milligram in a quarter of a cubic centimeter of water, under the skin of a small bird, such as a chaffinch or a sparrow, kills it in five to twelve minutes. One observes torpor and coma, then a period of excitation, with convulsions and tetanic contraction. In connection with the subject, a correspondent of *La Nature* calls attention to a passage of Rabelais in which the poisonous nature of human saliva is recognized.—*Adolph G. Vogeler, in Scientific American.*

Ear Affections in Childhood from Dentition or a Carious Tooth.—A considerable portion of the blood-supply of the membrane of the drum is derived from an artery that leaves the internal carotid in the carotid canal and proceeds by a very short course directly to its destination. Being thus closely connected with a large arterial trunk, this small tympanal branch of the internal carotid possesses very favorable circumstances for a speedy augmentation of its blood-supply. The nervi vasorium constituting the carotid plexus at this part of its course come largely from the optic ganglion. On the other hand, the interior dental nerve supplying the decayed tooth, or the gums, as the case may be, also communicates with this ganglion. We thus arrive at a direct channel of nerve-communication between the source of irritation of the tooth and the vascular supply of the drum-head.—*From "Deafness, Giddiness, and Noises in the Head," by Edward Woakes, M.D.*

Necrosis of Inferior Maxillary.—This man, who has been etherized, suffers from the effect of the eruption of a wisdom-tooth. It is quite apt to cause trouble. The eruption occurs often late in life, when it is apt to result in an abscess, sometimes necrosis. Here it has caused necrosis of the lower jaw, and on introducing the probe through one of the abscess openings the extremity comes in contact with bone, not only dead, but also loose. By extracting the loose pieces we can probably cause the openings to heal up.

The rule in all cases of necrosis of this, as well as of all other bones, is to wait until the sequestrum or dead bone has separated from the living. If you tear it away too quickly, necrosis occurs in the bone from which the piece is torn away.

Looking at this man's left cheek we see two sinuses. Passing in a probe at one of these openings and bringing it out at the other, we cut through all the intervening tissue. Then inserting our forceps, we remove all such pieces of bone as lie loose. Three pieces are all that are loose in this case. All that is now necessary is to simply dress the wound as we would an ordinary open wound.—*University Hospital Reports, Clinic of Dr. Agnew, Med. and Surg. Reporter.*

Metallic Springs for Tooth-Plates.—I had occasion, in a case of peculiar difficulty to use the ordinary gold spiral springs to retain in their position a set of teeth for a patient who was so awkward and clumsy that he broke one or both of them every second day. I therefore had the springs made of steel wire, with the most satisfactory results.

The fact that steel wire is not materially altered by chemical action in the mouth was demonstrated by Mr. Walter Coffin at the International Medical Congress, where he referred to numerous cases in which steel had been used for regulating teeth, and showed plates that had been so worn for many months. If these facts were more generally known, and the special qualities of toughness and elasticity possessed by steel recognized more fully by our profession, I am sure that it would soon supersede the use of all other metals for these purposes.—*Nathaniel Stevenson, in British Med. Journal.*

Ammonio-Sulphate of Copper in Neuralgia.—Dr. Féréol again urges the employment of the ammonio-sulphate of copper in stubborn neuralgia, but, to avoid the disagreeable taste of the medicine, he now administers it in bread wafers. His formula is as follows:

℞.—Cupri ammonio-sulphat., gr. $\frac{1}{3}$;
Bismuthi subnitratis, gr. iv.—M.

Inclose in a *cachet de pain* (bread wafer) for a single dose.

Five of these are to be taken daily while eating. The amount taken daily may be gradually increased to ten doses, care being taken to swallow the powder during a meal or after having swallowed a glass of milk, to avoid the direct action of the salt upon the stomach. Ordinarily patients fail to taste the disagreeable savor of the medicine; at times, however, sickness of the stomach supervenes, so that it must be stopped.—*La France Médicale*, 1881, vol. ii., p. 41.

HINTS AND QUERIES.

"He that questioneth much shall learn much."—Bacon.

Correspondents desiring a reply in this department are requested to make use of *distinctive signatures or initials*, and avoid the practice of signing their communications Reader, Subscriber, etc.

Correspondents who wish notice to be taken of their communications should authenticate them with their names. We cannot insert queries or replies except they are so accompanied. Names not necessarily for publication.

Will some one who has experimented, or knows whereof he writes, be good enough to give a good formula of salicylic acid as a mouth-wash for suppurating gums, and what preparation, if any, of eucalyptus has been used or would be

advisable to use for the same purpose, or has any one experimented with the oil gaultheria as an antiseptic?—if so, with what results?—J. W. B.

A servant-girl, sent to me by one of my patients to have a tooth treated for alveolar abscess, presented the usual appearance of that disease—the cheek so enormously swollen as to nearly close the eye. On examining the mouth the left superior first molar was found to be largely decayed, a delicate probe discovered the pulp to be still living, and the tooth itself was found to be not in the least sensitive to pressure; evidently the cause could not be here. An examination of the remaining teeth on that side, though difficult, considering the swollen condition of the cheek, discovered them to be all in a healthy condition. Passing the finger along the bone no swelling could be found, but this examination made it plainly evident that the tumefaction was entirely in the cheek. Placing the finger of the left hand on the inside of the cheek, and manipulating the outside with the right, no fluctuation or special induration could be discovered. Lifting out the cheek to examine its inner surface, there appeared at the orifice of the duct, what seemed to be a small curd of pus; pressing upon the cheek, and with a pair of pliers catching at the supposed suppurating matter, I drew from the duct about an inch of broom-corn!

It appeared that the girl in sweeping a room would pick up the small pieces of broom-corn that dropped from the broom and put them in her mouth until she came to the window, when she would spit them out. This piece had evidently tilted against the opening of the duct and been driven in by the lower teeth on closing the mouth.

Nothing further was done, and in two or three days she was entirely well.

[The letter accompanying the above having been mislaid, we are unable to give the name of the writer.—Ed. Dental Cosmos.]

Fillings of Felt Foil and Gold Combined.—In the Dental Cosmos for August, '81, Dr. Kingsley is reported to have spoken strongly in favor of fillings of gold and amalgam combined for approximal cavities in bicuspids and molars. He begins the filling in the cervical part of the cavity with amalgam, and, having filled it one-third or one-half full, he completes the filling with gold.

When I have tried to complete fillings at one sitting made in this manner, I have experienced difficulty from the giving way of the amalgam under the impact of the mallet while inserting the gold. And the result has been equally unfavorable, whether I have made use of a slow- or a quick-setting amalgam. By dispensing with the mallet I have attained partial success. Amalgam should not be disturbed while hardening. If the gold is put in at a subsequent sitting we can have both materials in their best condition.

I have had eminent success by combining metals in this way, with the difference that I use felt foil in the place of amalgam. I fill the cervical part of the cavity with felt, and carry the filling towards completion as far as I deem best for the case in hand, and finish with gold. There is no difficulty about starting with the latter, for cohesive gold will adhere perfectly to the felt. This quality that enables us to use the gold and felt interchangeably, with the same instruments and like manipulation, consitutes it the best metal for use with gold in the same filling. Large cavities, even in the incisors, may be filled nearly full with felt foil and finished with gold; and in soft, chalky teeth such fillings are much better, I think, than if composed entirely of gold. I think we have no other metal that makes as good an edge at the cervical margin of a cavity as the felt foil.—F. H. Guiwits.

What I Know about Having Teeth Filled.—About ten years ago I had the right superior molar filled on the anterior surface. It was separated by filing, and from that time it was a source of constant annoyance and pain. I could not masticate anything without its packing on the gums and becoming so disagreeable that I had to stop and remove it. I cannot adequately describe the annoyance it was to me; only those who have had similar experience can understand my suffering. About seventy-five dentists will remember me as the patient at the clinic held at the Cotton Exposition here last year, and certainly will remember the operator, Dr. Marshall H. Webb, who used his electro-magnetic mallet and engine. Let me say here that what I experienced in that five-hours' sitting has been of some benefit to my patients, especially in the mitigation of their sufferings.

Here are some of the points that were impressed upon my mind:

First. Put the rubber dam on for nearly every operation.

Second. Be very careful not to allow the clamp to impinge on the gum so as to give pain.

Third. Select patients for a clinic from one class of humanity—dentists.

Fourth. Do not run your engine-bur so fast that it becomes heated, and do not allow your electric or any other mallet to strike its hardest blow. I do not think it requires a very hard blow in using cohesive gold, if it is properly manipulated.

Fifth. Now comes the point that stirs my philanthropic impulse, and I would that I could impress it upon every dentist so that he would practice no other method—*make "knuckle" fillings* where there is any separation—so as to prevent the food packing on the gums. I remember Dr. Webb with gratitude every time I eat. Contour your fillings so as to restore the tooth to its normal shape.

I will try to describe Dr. Webb's method in filling two teeth. The teeth were the second bicuspid, posterior approximal surface, and first molar, anterior approximal surface, right superior maxilla. Dr. Webb opened the cavity in each down to the grinding-surface, and back on the grinding-surface far enough to give good anchorage for contour work. He did not spare tooth-substance until the cavities were properly shaped to retain the filling. The cutting was done with sharp burs run by an electro-motor. The bicuspid was filled first and finished. The cavity in the molar had extended above the old filling till it was under the gum. That was filled about half way down and finished off with the file and polishing strips. The teeth were then further separated by wedging. The filling was then completed and contoured so that when the wedge was removed the teeth came together, the gold only touching near the end of the crown. Cohesive gold was used throughout, and one retaining-point drilled from which the filling was started. Thorough work was done at the cervical wall, in preparing the cavity, in packing the gold, and in finishing the filling.

Facts are proved by evidence, and in the discussion of the various methods of saving teeth it is well to take into consideration the question upon which the evidence cumulates. We have testimony from dentists, and I give this as from the *patient*, having the dentist's ability to decide.—W. G. Browne, *Atlanta, Ga.*

Metal-Clad Casts for Celluloid Work.—I find it impossible, with the best plaster I can obtain, to make casts hard enough to prevent projecting points on the alveolar ridge from shaving off when closing the flasks in using celluloid. In the case of temporary plates, so called, it often is better to have the plate come

up over the ridge in front, even if the ridge is rough and jagged from recent extraction. The plate is more firmly retained than when the teeth are set upon the natural gum. Single teeth without gums can be used, the celluloid making a good-enough artificial gum.

Metal casts made in the usual manner are, of course, proof against fracture; but sometimes it is difficult to separate them from the plate; and when teeth with gums are used there is great danger of fracturing the porcelain.

To obviate the difficulties above noted, I make casts of plaster, having the alveolar ridge armored with metal. It is easy to do, and this is how: Take the impression in plaster, dry it, then stick carpet tacks into the part of the impression corresponding to the alveolar ridge, and in front set in a blunt, round-nosed wooden wedge. Now melt the metal—only a little is needed—and pour, first in one side and then in the other side of the impression. The metal will take hold of the tacks and lie against the sides of the wedge. Now remove the latter, and then immerse the impression, with the metal in it, in water, to restore to the plaster what was lost by drying it. Oil or soap the impression where it is not covered by the metal, and then complete the cast with plaster. When removed from the impression, the heads of the tacks will be in the plaster part of the cast, and the points will be in and reach through the metal. Cut or file off the projecting points. Here we have a cast that anybody can see has business in it.

This cast can readily and without danger be separated from the plate. The metal is in two portions or wings, the wedge that was set in the impression having produced this result. And this point is essential. The plaster portion of the cast, of course, will be first removed, after which the back ends of the metal can be pried inward, the metal, being cut across in front, offering no obstacle by its rigidity to the approximation of the ends. The metal may be tin, type-metal, tinman's solder, or any other easy-melting alloy. When but little metal is used and its melting point is low, there is no need of drying the impression before pouring the metal. Instead of the tacks, wire may be used, and I like it better. Bend a piece of wire zig-zag, like a rail fence, and then bend the fence to the curve of the impression and set it in so that half of the fence-corners will rest upon the plaster and will be embraced by the metal when poured, and the other half of the corners will rise above the metal to enter the plaster, thus firmly holding the metal in its place.

With care in setting the wire or tacks, and by lifting the impression and pouring but little metal at a time, a thin plating can be put on the outer border of the alveolar ridge.

This method of strengthening the frangible parts of casts is so simple, and requires so little time, that I believe those who try it will be slow to abandon it.—F. H. Guiwits, *Clinton*, *Mich.*

The Behavior of Plaster of Paris.—I have found that in its properties, and consequently in its behavior, plaster of Paris varies according to the degree of fineness to which it is ground, the degree of its calcination, and the manner of mixing and using it.

As plaster is generally used, the casts made of it expand and sometimes warp, causing great inconvenience. This, however, can be entirely overcome, and actual shrinkage of the cast secured, by the careful selection and proper manipulation of the plaster. Other things being equal, a coarse plaster expands more, but makes a harder cast than the finer grades. Increasing the degree of calcination hastens the setting and increases its tendency to expand.

Thorough mixing renders the cast less liable to warp, secures uniform hardness, and hastens setting. Very thin mixing aids in controlling expansion, but it retards setting, and the cast never becomes very hard. Mixing the plaster with warm water hastens setting, and thereby lessens the liability to expansion. Mixing a pinch of common salt with the plaster also hastens the hardening process, and thereby lessens expansion.

Packing the surface of the cast while setting causes uneven expansion and consequent warping. Wetting the cast before the setting process is completed increases its tendency to expand.

To secure accurate impressions or casts, select or prepare plaster to meet the requirements of the case. Mix well and get into place before it begins to harden. Avoid packing or wetting during the process of setting. If necessary (to prevent expansion), use warm water and salt; mix as thin as is consistent with the hardness required and convenience in use.

Samples of plaster cast on a straight, stiff square, or try-square, marked off into small fractions of an inch, will indicate the warpage and give the actual measurement of the expansion or shrinkage; and counter-casts, marked or notched, furnish similar tests.—GEO. A. FOWLER, D.D.S.

DENTAL EDUCATION.—With the rapid advance of dental science a great difficulty is experienced in regard to the education of the new members who enter the ranks of the profession. The fact is that a higher education is required than that which is now obtained. But how can students obtain the required education, with the limited time and means at the command of the majority of them? It is very easy for one who has ample means and time to get his A.M., M.D., and D.D.S.; but seven-eighths of the students have not the means, and cannot spare the time. Some have managed to labor awhile without college education, and gained the means wherewith they could struggle through the prescribed dental curriculum and obtain the D.D.S. Some have even gone further, and obtained the M.D. Then they argue that no man ought to enter our ranks without the degree of M.D., or at least D.D.S., forgetting that they have earned these honors with the means gained within the ranks.

At present those who can afford it take a college course of two or three sessions, as the case may be, but these are only a fraction of those who enter the ranks; the majority come from a preceptor or without any previous education. I suggest the following plan:

Let the curriculum remain as it is. Let the student attend two or three courses of lectures, clinics, etc., as at present. Let the teaching be progressive, and include only the most practical parts of a dentist's duties, and only so much of theory as is necessary to make the practical teachings understood. At the end of these terms let students pass an examination substantially the same as at present, but instead of graduating them to the full degree of D.D.S., D.M.D., or M.D., semi-graduate them, if you please, with a simple certificate, a B.D.S., (Bachelor of Dental Surgery), a D.M.B., (Bachelor of Dental Medicine), or an M.B., (Bachelor of Medicine), and let it be understood that either of them is simply a certificate which recommends its owner to that extent to the confidence of the public. Let it also be understood that the education is not yet finished, but that if the student pursues the study for three or five years more, and if, at the end of that time, he can pass a thorough examination, he can receive the degree of D.D.S., D.M.D., or M.D., as the case may be. Let all fees be paid as at present—that is, at the first or (as in this case it would be) the semi-graduation, including the fee for the degree which he is expected to get within three or five years. Thus the

education which the candidate has obtained becomes a money consideration; but he is entitled to a degree which he can obtain only by merit, and not otherwise. The opportunities for study for young practitioners are numerous and varied; the most of them, if they have their degrees, do not take advantage of them; but if one is expected to pass a subsequent examination, he will and must improve.

Thus the study of dentistry can be extended over a period of from five to seven years. In that length of time any one with the required ability and a common school education can become a dentist.

There is a great deal which it is very useful for a dentist to know, but which is not essential, especially in the first year or two of practice, though the gain of this knowledge will most assuredly help one to become a successful practitioner. —Louis Ottofy, D.D.S., *Lebanon, Ill.*

Dentists in the Army and Navy.—I noticed in the Dental Cosmos for January, 1882, an article by Dr. George H. Perine, of New York, in regard to dental service in the army and navy of the United States. It is something very much needed. I have been in the army for the past four years, and have done a good deal of dental work, but have met with a great many difficulties; among them the want of a suitable place to perform the work, and the having so many other duties to perform as to preclude the possibility of giving it the necessary time and attention. But, throwing all difficulties aside, I have accomplished much good, especially in my own company, where I can have the men under my care every day. I have impressed on their minds the great necessity of saving the teeth by providing tooth-powders and mouth-washes best suited to each case; distributing Dr. White's little pamphlet, "The Mouth and the Teeth;" filling decayed teeth that would otherwise have to be extracted, etc. The men are all willing to pay for the work, but I think our government should form a special department in the medical department of the army and navy, and provide it with the necessary materials and appliances, for the benefit of its soldiers and sailors. Dental surgeons could be appointed or employed as contract assistant surgeons now are in the medical department. The troops stationed on the frontier fare much worse than those close to the cities or towns. They cannot have their operations performed at all, for there are no dentists probably within three or four hundred miles, and consequently an aching or decayed tooth has to be extracted —often by inexperienced hands. It is a want that has long been felt both by the officers and the enlisted men of the army and navy. I propose that the national dental associations make the facts known at their next annual meeting to the Honorable Surgeon-General, and also hope to hear from others on this subject.—W. F. Hutchinson, U. S. Army, *Comba, Dakota.*

I notice that your correspondents, under the head of "Hints and Queries," continue to agitate the question of dental appointments in the army and navy. In your March number one says: "Let me suggest that the best presentation of the importance and necessity of such appointments, together with suggestions of what would be proper regulations for the government of such appointees, be prepared and furnished to the dentists of the entire country," etc. I would suggest that this be done by the secretaries of the army and navy respectively, or by subordinate officials in those departments of the government. If there is any merit in this question, it is unfortunate for the profession that its members should be the first to agitate it. This course is obnoxious to a charge of selfishness and an overwhelming desire for unprofessional promotion.—J. L. F.

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ORIGINAL COMMUNICATIONS.

THE MINUTE ANATOMY OF THE TEETH IN THE LIGHT OF THE BIOPLASSON THEORY.

BY C. HEITZMANN, NEW YORK.

(Address before the New York Odontological Society, February, 1882.)

MR. PRESIDENT—Gentlemen of the Society: It was with great pleasure that I accepted the invitation to bring before you a subject which, it seems, gains more interest from year to year. It is my purpose to say a few words about the general bearing of the new doctrine which I had the honor to promulgate about ten years ago. It was your profession (thanks to noble-hearted men such as Dr. Atkinson) which first gave cordial recognition of my work. My laboratory was favored especially by dentists, and, without boasting, I can say that most of the work in the investigation of the anatomy of the teeth which has been done in the last few years, has emanated from thence.

You all know, Gentlemen, what the cell theory meant. I don't wish to say much about it. You all have learned what the cell was thought to be. Gradually, however, all the assertions concerning the nature of the cell were found not to be in accordance with the facts observable under the microscope; so much so that about ten years ago Drysdale, of London, said, "A cell is like a gun-barrel without a gun and a lock." It was denied that its contents are liquid, then it was denied that a nucleus was essential, and then everything was denied; still, one thing was kept—that was the name. It seems that later observers, and particularly Germans, thought it a necessity to adhere to that word, to which no meaning could be attached, for twenty years.

I wish to commence with the statement made at the beginning of the seventh decade of our century,—by Beale, of England, and Max Schultze, in Germany. Lionel Beale in 1860 offered a very plausible theory concerning the structure of the tissues. Unfortunately,

however, his microscope, although enlarging very much, showed him very little. In his publications, for instance, an amœba was depicted of the diameter of a thumb-nail; there was a central nucleus, and all the rest of the amœba was structureless. A year later Max Schultze issued the protoplasm theory; he claimed that the real living part of the cell is not a liquid, but a jelly-like mass—for which he proposed the term *protoplasm*—endowed with a nucleus and exhibiting granules. In his idea the constituent elements of the cell were a semi-fluid mass holding a central nucleus and a certain number of granules.

In the same year a critical mind (E. Brücke) said that we have no right to maintain that a nucleus is an essential part of the cell, inasmuch as all of us know that there are a great many so-called cells that are destitute of a nucleus. The idea developed, especially with Stricker, that even the granules were not essential; perhaps these were secondary productions, perhaps they were taken into the protoplasma from outside; everything that was left was the jelly endowed with life.

All these gentlemen, of course, knew that a body devoid of structure could not exist; and if they said structureless, they meant, in all probability, that the structure was not perceptible. Such was the condition of things when, in 1872, I took up the study, and, as you perhaps all know, started with the most elementary formation of life—with amœbæ.

I discovered a delicate reticulum pervading the whole mass called at that time protoplasm—a reticulum which, whenever the nucleus was present, was in direct union with it and produced an investing thin layer around the amœba. This layer is by no means identical with the membrane of the cell, inasmuch as it admits of a great degree of stretching. When I saw this reticulum, with its points of intersection, changing its shape, growing, in certain conditions, I said, "Here is a formation in the protoplasm which is possessed of all the properties that are necessary for the condition of living matter, viz.: *motion*, *change of shape*, and *growth*;" and I concluded that the solid nucleus, the threads emanating from the nucleus, the granules serving as points of intersection, and the investing layer are the *real* formations of living matter, while the liquid contained in the meshes is destitute of life.

The mass of the amœba, as you know, changes its shape by protruding offshoots, and creeps through the field of the microscope.

I concluded there was *contraction* of the reticulum from the fact that the granules grew larger at a certain part of the amœba, the meshes became narrower, and the liquid was driven to another portion of the amœba, which is inclosed by a continuous layer of living

matter. The liquid driven to the opposite portion produced a stretching of the reticulum, which I termed *extension*.

All this seemed to me a settled fact, and was published as such, but no attention was paid to it, although some observers had seen the reticular structure before me, and in different objects. This was true of Nasmyth. I was astonished to see his figures, published in 1839, showing this reticulum in the formation which covers the crown of the tooth. In 1868 Frommann demonstrated the reticulum in the so-called ganglion-cells of the brain, as did others in different places, but none of these observers understood its significance. I was the first to maintain that all that which was formerly termed protoplasm was endowed with reticular structure.

When, at the close of the year 1874, I left Europe in disgust and despair and came to this country, I found here the heartiest support and encouragement. The first proof of the existence of the reticulum was given by J. J. Woodward, who, without knowing anything about its presence, made micro-photographs, and these plainly exhibit the structure. Dr. Louis Elsberg early expressed concurrence in this view, based upon studies in my laboratory; he first proposed a new name for the designation of this theory, and that is "The *Bioplasson* Theory," in contradistinction to *proto*plasma, which means something formed, while *bio*plasson means the forming or living matter.

The word *cell* after this discovery, of course, became worthless, and it was Elsberg who proposed for the word cell the word *plastid*, or *bioplast*. I give preference to the word *plastid;* the word, however, does not matter if we only know what is meant by it. To-day there are two dozen of the very ablest microscopists, both abroad and in this country, who have seen the reticulum, and who fully agree with me and give me the credit for its discovery, as being the general rule in any bioplasson formation. Strange to say, however, from certain parties some little opposition is made.

A microscopist of this city publicly announced that he had never seen the reticulum, kindly adding that very probably his microscopes were not good enough to enable him to do so. Lately Dr. Lester Curtis published an article on this subject, and stated that he did not see the reticulum. This is a very modest way to announce that one cannot see what another can. If a person publicly confesses that he cannot play on the piano a master-piece of Liszt's, we are all willing to believe it; but does it follow that others cannot play the piece either? What is gained by such a confession? Dr. Curtis gives illustratons of what Elsberg and I have said and seen, and of what he could *not* see. I mention this because you are all prepared to understand that delicate observations of this nature are not easily

made by every one. A great many look in the microscope, but very few can *see.* If one of you who had never played the violin were handed a good violin and told to play a tune, he would say, "I can't." Let him practice for a few years, and learn to play a tune. It is very much the same with the microscope. If you look in for but a short time, you cannot see. It required more than fifteen years' application to enable me to see what can readily be seen, and if a tyro comes and declares that he cannot see, I do not think such assertions should be taken as proofs against facts corroborated by others.

According to the new views, the structure of the plastid is a very complicated one. Indeed, we are astonished to see that every particle of a plastid—its smallest portions, for instance granules thrown off—floating about in a liquid, is endowed with all the properties that formerly were attributed to plastids; that is, motion and growth. We become convinced that it is not the plastid which is the elementary organism, but the granule of living matter; and this is considered as elementary only for the reason that our microscopes do not show more. If in time to come our lenses shall be constructed of better refracting media than glass (of diamond, for instance), perhaps we may discover more than we know at present.

These are the essentials of the new doctrine concerning the structure of "protoplasm." New views were also obtained concerning the structure of organisms ever so highly developed. It has been demonstrated that the body is by no means composed of isolated elements, so-called cells, as it was formerly thought to be. The best observers have held that the body was composed of a great number of individual cells, much in the way that a house is constructed of bricks—put together by cement. The bioplasson theory suggests that in the tissues of the body there is no such thing as an isolated cell, but that the tissues from the crown to the heel are one continuous mass of living matter, mainly in a reticular arrangement. Only the closed cavities of the body, the lymph- and blood-vessels, contain in a fluid isolated bodies in the shape of lymph- and blood-corpuscles, etc. In this view, therefore, the body is constructed like an engine in which all parts, though independent to a certain degree, are connected with one another so as to build up a continuity and render even the organism of man a grown complex amœba.

In this complex body there are portions of the living matter serving in the nerve action; portions in the building up of the lungs; other portions serving for motion. There are portions for the support of the body, such as the bones; others serving as tools, such as the teeth.

The new bioplasson view has thrown light upon the mode of development of the organism. Gradually the fact has been acknowledged

that there are at first three layers or leaves from which all tissues arise, the name epiblast designating the upper layer, mesoblast the middle, and hypoblast the lower layer. Our best modern embryologists have asserted that the nervous system, of which the first trace is visible close below the epiblast, is a festooning of the epiblast. In this view the outer covering of the body would give rise to the nervous tissue, the most active tissue of the body—the brain and spinal cord.

In the bioplasson view the impregnated germ is nothing but an amœba flattened out, as it were. We have an upper investment of the amœba representing the epiblast, and a lower investment, the hypoblast, while the main mass of the body represents the mesoblast.

In the amœba a so-called vacuole may appear temporarily, which is again inclosed by a thin layer of living matter, and we observe a closed space in the mesoblast—the first trace of the future heart. As in the amœba, the vacuole contains a number of isolated granules, —the first-formed blood-vessels, containing the blood-corpuscles. It is the mesoblast only which holds blood-vessels; the epiblast and hypoblast and their derivations will never show blood-vessels. In this view, therefore, the entire body is constructed of only four kinds of tissues, three of which, viz.: the connective tissue, the muscles, and nerves, arise from the mesoblast.

The connective tissue, among other functions, gives support to the whole body in the shape of the skeleton, and serves in the process of mastication in the shape of teeth.

The elements of the epiblast and hypoblast are called epithelia, investing the outside of the body and the cavities which are in direct or indirect communication with the outer world.

If you compare, Gentlemen, the bioplasson doctrine and its consequences with what Beale has said, you will at once see the difference.

Beale claims that in the fully-developed organism the greater part, or, at least, a very large part, of the body is destitute of life. He asserts that the living matter is represented mainly by the nucleus, whereas the tissues are formed material, and not alive. He claims that the most active tissues of the body, such as muscles and nerves, are formed material. This is the very objection that Bastian has raised against the teachings of Beale. In my view, every tissue is alive except the horny material, epidermis, nails, and hairs. We cannot conceive of a part of a living body destitute of life. Even in the comparatively inert tissues of the body, in the connective tissues, the bone, and cartilage,—the whole is pervaded by a reticulum of living matter.

The new bioplasson theory suggests that there is the greatest amount of living matter contained in this mass. We readily understand by examining the muscle the reason why it moves; it is essentially upon the plan on which the amœba moves. The nerve-tissue, Beale suggests, is formed material. We say it is living material of a very concentrated form, and thus we understand and get an insight into nervous activity, which is based entirely upon the motion of this delicate reticulum. The new doctrine suggests a number of facts, so far in full harmony with all our observations. The connective tissue is characterized by the presence of what is formed or the glue-yielding substance. Not every variety is glue-yielding. Some of these substances seem like glue, and others, upon being boiled, give a gelatinous liquid, but not sticky; these are only special varieties of one and the same substance.

The new theory suggests that the inert basis-substance arises from the liquid present in the meshes of the bioplasson reticulum, which, although concealed in the basis-substance, remains unaltered.

The four varieties of connective tissue are the jelly-like myxomatous, the fibrous, the cartilaginous, and the bony. All these varieties have their representatives in the tissues constituting the tooth, and in the tissues attached thereto. The myxomatous tissue, the best representative of which is the umbilical cord, is present in the pulp of the tooth. The fibrous connective tissue, the best representative of which is tendon, being dense, firm and striated, we find about the tooth in the pericementum and periosteum. The cartilaginous tissue is not directly involved in the formation of the tooth, but it gives rise to the jaw-bone, and plays an important part in the formation of the jaws; while the bony tissue is of the greatest importance, inasmuch as it furnishes the sample of the structure which, with some variations, is found in the formation of the tooth.

In 1873 I first asserted that all the various connective tissues are provided with living matter. So great was the surprise of the learned world at these assertions that several years afterward Frey, of Zürich, who wrote a book, tried to ridicule the whole thing and to kill me off by placing me in a foot-note in his book. Of course, it is easy enough to ridicule assertions so long as we are not satisfied that they are correct, but if they prove to be correct such practice becomes very dangerous.

Stricker, of Vienna, in whose laboratory I executed much of my work in 1873, saw most of my specimens, although I did not care much for his opinion. He was slow in accepting my assertions, but four or five years ago he published an article claiming that the reticulum was present in the nucleus. Last year he surprised me with a copy

of his latest publication at that time, wherein he corroborated the presence of the reticulum in salivary corpuscles; more than that, he asserts that the reticulum is present in the cornea of the eye, and that where at one moment is protoplasm, after a while basis-substance will be seen, and, in the place of basis-substance, after a while will be seen protoplasm.

In Stricker's laboratory Spina, two years ago, made the wonderful discovery that this reticulum existed in the cartilage,—something that I published in 1872 and 1873. He discovered a new method for its demonstration,—namely, treatment with *alcohol*, a method so simple that to-day even a child can see the reticulum in cartilage.

Meantime, I have not been idle. In the past seven years I have demonstrated all that to hundreds who were desirous to learn something about the new theory. It seems to me that what we have done in the past seven years in this country carries us quite ahead of the old world; we have become the leaders in this line of investigation.

As regards the bone-tissue, the idea was prevalent for a number of years that there were in it spaces filled with liquid, but nothing was known about the seat of life in the bone, for this reason: that a discrimination between the living and dead (necrotic) bone was impossible.

Virchow thought that the cells, which at that time were identical with the lacunæ, were the seat of life, although in his view the cells contained a liquid. With our modern views, it is hardly necessary to say that a liquid is never endowed with life. In 1870, in Stricker's laboratory, it was first found that the lacunæ of the bone-tissue held protoplasm. In our present views the bone is not only supplied with living matter, with plastids in the lacunæ, but also the offshoots of the lacunæ,—the canaliculi,—contain delicate filaments of living matter connecting the plastids; thus the bone-tissue is rendered an uninterrupted reticulum of living matter just as is any other tissue.

And now a few words concerning the minute anatomy of the teeth.

The manner of examining the tissues of the teeth in former times was like this: the tooth was allowed to dry; it was then split into thin laminæ by means of a saw; these were then ground down by means of a stone. In specimens thus obtained the lacunæ of the cement, the canaliculi of the dentine, necessarily looked black owing to the presence of a little air and some extraneous matter, but not the least idea could be obtained in this way as to the contents and the formations of living matter which enter largely into

the construction of the tissues of the teeth. The first necessity, therefore, of research in the new direction was to devise a new method of preparing specimens for investigation, and this was found in the use of chromic acid for softening the teeth. This proved to be a powerful reagent for extracting the lime-salts of the tooth and for preserving, at the same time, its soft parts. It was introduced by H. Müller, in 1868, for preparing bone. All previous observers were satisfied to examine dry bone as well as dry teeth, forgetting that such dried material could not be useful for study, as it merely showed the frame of the former tissues, and not the tissues themselves. If, on the contrary, the soft parts be preserved and retained so as to be visible with high amplifications, they are in the best possible condition for the observation of new facts concerning their structure, which is the case with the specimens prepared by the use of chromic acid. Enamel, however, never could be softened by this means. For the study of enamel we took a freshly-drawn tooth, and, keeping it moist in order to preserve the soft parts, ground it thin by means of the way formerly adopted. The new facts obtained by this simple way are to-day well established.

All sensible dentists must have been aware of life in the tooth; the simple fact that eating a sour apple would produce a certain effect upon the teeth—"setting them on edge"—has occupied the attention of thoughtful men for a long time. Some have spoken of the chemical action of the acid on the enamel, others of the conduction of the acid down to the pulp-chamber; but all that was unsatisfactory. Certainly every dentist must have observed that the living dentine is endowed with a high degree of sensibility, especially in certain places; for instance, at the boundary line between the dentine and enamel at the neck of the tooth. Many other facts, the reaction upon filling, the so-called solidification around a filling, could not be explained by the former view. Tooth was considered to be cartilage with infiltrated lime-salts in which there are canaliculi, holding central fibers, the nature of which was not known. The enamel, even in the eyes of the best observers, was thought to be a crystal, a calcareous mass epithelial in its origin. The new researches show that the tooth is pervaded by a bioplasson reticulum in the same way as an amœba. It does not creep out of the mouth like an amœba, on account of the infiltration with lime-salts in the lifeless portion of the tooth, *i.e.*, the original liquid, which has become a solid basis-substance, while the reticulum remains unchanged, not only throughout the dentine, but also through the enamel.

We have learned, through the researches of Bödecker, that the fibers present in the canaliculi are living matter. These first had

been depicted in Richard Owen's celebrated work by the draughtsman employed by him. In the picture we see the fibers, while no mention is made of them in the text. Tomes was the first to describe the fibers, and he thought they were probably nerves. This approaches our views, for we can prove living matter proper and nerve-tissue to be one and the same thing; and we can trace the ultimate fibrils of nerves to direct or indirect connection with the dental fibers. Any irritation of the dentinal fibrils is transmitted to the nerves which are present in the pulp-tissue.

It has been demonstrated that the so-called cartilaginous basis-substance is pervaded by a delicate reticulum, and, although this cannot be directly seen, we have to assume its presence from facts obtained in the study of embryology, and in the study of the different appearances of the teeth in caries, as shown by Frank Abbott.

The enamel proves to be a live tissue, and supplied with a certain amount of living matter,—scanty, it is true, but in structure akin to dentine. Although its first stage is epithelial in nature, Bödecker's studies have shown that this epithelium is in turn changed into medullary tissue, which gives rise to the enamel—a complicated course which, however, is known to occur in the thyroid body.

The enamel-rods interlace in different directions, have interstices between them, and here is found living matter, which, as a reticulum, pervades the whole enamel. In the earliest formation of the tooth in the fetus, when the structure of the enamel is identical with that of the dentine, we can see the fibrils with great distinctness.

We have obtained an idea about the life of the enamel and the dentine, and, of course, the cementum ranks among the living tissues, as does bone.

The last question to be settled in this study was the nature of the pulp-tissue, and I dare say that to-day the character of this tissue is plain, both physiologically and pathologically. Dr. Bödecker's specimens have enabled me to say so.

In the light of the new views, Dr. Frank Abbott has studied the process of caries, and has shown that it is an inflammatory process which, owing to the scanty supply of living matter, is limited in its effect. While all tissues supplied with blood-vessels, if inflamed, produce something new, an outgrowth of new tissue, caused by increase of the inflammatory corpuscles (which are essentially the same as embryonal), in tissues destitute of blood-vessels, such as cartilage, the inflammation stops at a certain point, mere dissolution of the basis-substance takes place, the living matter reappears, but no outgrowth from that matter will occur. It has been proved that this process takes place in caries of the teeth. The first step in the process is that the lime-salts present in the meshes of the reticulum are

melted out, the glue-yielding basis-substance is liquefied by means which we do not fully understand, and then the reticulum is re-established. The whole decalcified mass, still endowed with life to a certain extent, at last divides into medullary elements. Here is a stand-still, and new formation of living matter does not take place. The soft material becomes the seat of growth of leptothrix, and represents a decayed mass, which, constantly irritating, leads to a continuance of the caries.

The next important fact, theoretically at least, is the inflammation of dentine in its middle and inner portions, inducing secondary dentine, which Dr. Bödecker has shown to be of regular occurrence with advancing age or whenever irritation takes place. He found that this irritation, proceeding from the periphery to the center, led to a new formation of the tissue, which was proved to be secondary dentine in its three main varieties: with irregular canaliculi, with laminated structure, and structure kindred to bone.

Our specimens demonstrate that the secondary, like the primary, dentine is permeated by living matter, which, by a process of inflammation starting in the pulp-tissue, breaks down into medullary elements in globular fields or territories.

A subject which has been studied for two years in my laboratory by Frank Abbott, but which is not yet fully ripe for publication, is that of the melting of the enamel, caused by the same process which melts down the cementum and the dentine in deciduous teeth. There is in Tomes's book an illustration which shows that such a melting of enamel does take place, but, as we trust only to our own observations, we must postpone everything concerning this branch of the subject until we have trustworthy specimens. What we have seen is that a process of melting occurs on the plan of a slow inflammation; first, a liquefaction takes place in the basis-substance; afterward, decalcification, and then dissolution of the glue-yielding basis-substance. Thus the living matter becomes freed. Abbott found peculiar excavations, which are the territories of the tissue of the cementum. Kölliker, in 1874, first drew attention to such excavations on the surface of growing bone. At that time nothing was known as to the presence of living matter in cementum, and we should not be surprised that he was of opinion that these excavations and the bodies seen in them were something penetrating from the outside. So great was his respect for these bodies that he gave them the name of "bone-breakers." Reference was made by him to the melting process in temporary teeth. What we have seen does not confirm this bone-breaker theory at all. We say that the lacteal tooth, so long as it is connected with the soft surrounding tissue, must be endowed with life; therefore, the appearance of excavations filled with bioplasson

is nothing but the reappearance of the original embryonal condition. The more surprising fact is that from this newly appearing tissue filling the excavations of lacteal teeth regular bone may arise.

This is only an outline of what has been done so far. I am about to publish the results of ten years' labor in the shape of a book. I have endeavored to reproduce all the work done in my laboratory by a number of gentlemen during the past seven years, in order to show what has been performed in America. My idea just now has been to give a mere sketch of the bioplasson doctrine, for two reasons: first, to render the future papers of Dr. Bödecker (and, I hope, also those of Dr. Abbott) clear and acceptable to you; and, secondly, to caution you against rough treatment of the teeth. Some of you have been accustomed to work upon the enamel as if it were worthless stuff,—calcareous matter void of sensibility. My studies, although theoretical, I think, have some value to the dental practitioner, in having demonstrated that all dental tissues are alive, and I cannot believe that the removal of any part of these tissues can be done with impunity. The punishment will come, sooner or later, if you deprive the tooth of its best protector,—the hard, solid enamel.

Dentine, apparently an inert tissue, reacts upon everything we do with it; a perfect revolution takes place in the dentine if you fill a tooth with any material. You have to regard the conditions surrounding the filling and the reaction which will follow upon its introduction, and much depends upon how you do your work and the material which you use as to what this reaction will be—whether beneficial or the source of new suffering to the patient.

I announced a year ago that, from my theoretical stand-point, I should not insist upon filling temporary teeth with gold. I was misunderstood at the time. I did not mean that gold would do harm, but meant that it was unnecessary; in the lacteal teeth, so poorly provided with lime-salts, a slight protective filling does all the work one may expect.

A great many other points are attached to these new views. We know that all scientific research is at first of little practical value, but such an application of the theoretical knowledge must come without question. A great many practical questions are involved in the study of the anatomy of the teeth generally. I often say that a dozen dentists could be kept busy for a dozen years in finding out new facts based upon the revelations of the bioplasson theory. The interest in the subject will gradually increase, especially if the right kind of practitioners will continue to assist me as they have so successfully done hitherto.

THE MINUTE ANATOMY, PHYSIOLOGY, PATHOLOGY, AND THERAPEUTICS OF THE DENTAL PULP.

BY C. F. W. BÖDECKER, D.D.S., M.D.S., NEW YORK, N. Y.

(Read before the New York Odontological Society, March, 1882.)

METHODS OF PREPARING SPECIMENS.

THE best method of preparing pulp-tissue for examination is, immediately after the removal of the tooth from the mouth, to place it in an aqueous solution of chromic acid of one-half to one per cent. in strength. To this mixture may be added, every third or fourth day, to hasten the process of decalcification, one or two drops of dilute hydrochloric acid. It is important to use a large quantity of the liquid—not less than a quart for one or a few teeth—and renew the same at least every six or eight days. After the teeth have been in the chromic acid solution a few weeks, the peripheral portion of the dentine will become sufficiently soft to be cut by a razor. When the hard portions of the dentine are reached by the cutting-instrument, the extraction of the lime-salts must again be continued in the manner described above until the pulp-cavity is reached.

Another method is to split the tooth as soon as possible after its extraction from the mouth with a strong pair of excising-forceps. The teeth best adapted for this method are the incisors, canines, and bicuspids. By an experienced manipulator the pulps of molars can be extricated from their inclosing walls, but with less success than in the teeth before mentioned. In splitting, put the cutting-edges of a sharp pair of excising-forceps in the longitudinal direction near the apex of a single-rooted tooth, then make a sharp and quick pressure, when, as a rule, the tooth will split into halves with the pulp-cavity exposed. Immediately moisten the pulp with a solution of chloride of sodium in water, of the strength of about one-half per cent., and then remove the pulp. The greatest care must be taken in removing the fragments of the tooth from the pulp-tissue, to avoid tearing the organ, which greatly alters the microscopical aspect of nerve-tissue. If the pulp is to be stained with carmine, hæmatoxylon, fuchsine, hyperosmic acid, picro-indigo, or chloride of gold, etc., place it in the staining-fluid immediately after its removal from the hard parts of the tooth.

Among the reagents mentioned I have found but one of considerable value, viz.: the solution of chloride of gold of the strength of one-half per cent. This reagent can be applied to fresh pulps as well as to very thin sections obtained after hardening in chromic acid. These specimens, however, must, as a matter of course, be carefully washed with distilled water before adding the chloride of gold solu-

tion. This reagent may be allowed to remain in contact with the specimens for from twenty to thirty minutes, when they should again be washed in distilled water and exposed to daylight. In a few days fresh specimens will assume a bright violet color, while sections which have previously been in a chromic acid solution become brownish-violet. Osmic acid, in solution of one per cent. in strength, renders the contours of the constituent tissues, and especially those of the medullated nerve-fibers, more distinct, as it stains the nerve-fat dark green. Both fresh and chromic acid specimens may be treated with osmic acid. Thin sections do not require more than an hour's exposure to this reagent, while whole fresh pulps may be left in it for two or three hours. Except the ammoniacal solution of carmine, which is known to be excellent for staining certain parts of the tissue, I would not lay stress upon applying any of the other reagents mentioned.

If we wish to examine the pulp, together with the inclosing dentine, or a pulp-stone, the specimen previously softened by chromic acid must be imbedded in a mixture of paraffine and wax, which is best done in the following manner: place the softened tooth in absolute alcohol for about twenty-four hours; then prepare a box made of rather thick paper, somewhat larger than the specimen; warm the imbedding mixture, which consists of about eight parts of paraffine and one of white wax, until it is barely liquid; pour enough of it into the paper box to about half fill it; then take the specimen out of the alcohol, and as soon as it begins to dry place it into the paper box and pour over it some more of the paraffine and wax, so as to cover it completely. But care must be taken not to have the imbedding mixture too hot, as it may injure the living matter. The specimen then, after the mixture has become sufficiently hard, is ready for cutting, when very thin sections can easily be obtained.

If a fresh pulp is thin enough it may, immediately after its removal from the split tooth, be transferred to the slide, with the addition of an indifferent fluid, such as the solution of chloride of sodium, etc. But a slight and careful pressure upon the cover is necessary in order to spread fresh specimens. The fresh pulps of lower incisors, being the thinnest, are the best adapted for examining the system of blood-vessels. In a short time, however, these blood-vessels fade away, and the specimen becomes unfit for preservation. Isolated pulps may be placed between two plates of velvet-cork, and thus cut into thin sections with the razor. I would recommend dilute glycerin as the best preserving-fluid for pulp-specimens.

The Minute Structure of Normal Pulp-Tissue.

If we examine a thin longitudinal or transverse section of the pulp with low powers of the microscope (200 diameters), we recognize a

large number of blood-vessels and bundles of medullated nerve-fibers. The majority of these blood-vessels are capillaries; the veins are less numerous, and arteries are scarce. In many pulps we find no arteries at all, in others a limited number, very often in the midst of the medullated nerve-bundles. The medullated nerve-bundles mostly run in a longitudinal direction, but not infrequently we observe smaller bundles, or single medullated nerve-fibers, diverge from the longitudinal direction, running obliquely through the pulp-tissue.

In transverse sections of the pulp we meet with arteries, veins, and capillaries, the first cut across, the others distributed in all directions. The bundles of medullated nerve-fibers are seen most distinctly in transverse sections. They often hold in their interstitial tissue capillary vessels and arterioles, which also appear in transverse section. In very thin sections it often happens that the nerve-fibers fall out, and then we see a roundish empty space bounded by the sharply defined external perineurium. The absence of an endothelial coat renders such spaces easily recognizable in distinction from blood-vessels.

The main mass of the pulp, as seen with low powers, is composed of a delicate fibrous reticulum, containing a large number of bright shining corpuscles. Longitudinal sections in many instances exhibit delicate fibrous bundles scattered throughout the reticular structure of the pulp, mostly in the neighborhood of large blood-vessels and nerve-bundles. Pulps composed of a fibrous connective tissue only are rather exceptional, and, as it seems, are without any relation to the age of the person. They are probably the result of morbid processes. Toward the outer surface of the pulp the reticular structure is, as a rule, denser than in the middle portions. This peripheral part is surrounded by a wreath of elongated formations arranged in a radiating manner all around the pulp—the so-called "odontoblast layer."

Higher powers of the microscope (500 to 600 diameters) reveal a minute reticular structure, consisting of delicate fibers or anastomosing bioplasson cords, with very small oblong nuclei at their points of intersection. The mesh-spaces inclosed by this reticulum either look pale and finely granular throughout, or there is, besides the pale granular substance, a bright yellowish body, either homogeneous or granular, of the size and aspect of a nucleus. The number of the latter formations varies greatly in different pulps. Where bundles of a fibrous tissue traverse the reticulum, there the latter blend with the former. In the fibrous bundles, besides the delicate fibrillæ, we see scanty and small oblong nuclei.

As mentioned before, the fibrous connective tissue prevails at the

periphery of the larger blood-vessels and nerve-bundles. In transverse sections these nerve-bundles invariably exhibit a distinct fibrous sheath containing oblong nuclei—the so-called external perineurium. The nuclei imbedded in the sheath do not project above the level of the sheath, as is plainly observable on empty ones where the fibers have fallen out, while the endothelia of blood-vessels of any description invariably protrude toward the inclosed space, thus affording an excellent means of distinction between blood-vessels and empty nerve-sheaths.

The arteries are characterized by the presence of a layer of smooth muscles, outside of which is seen a slight fibrous coat. The layer of smooth muscles necessarily thickens the walls of the blood-vessels, thus rendering them easily recognizable in transverse sections. The veins are marked by their large caliber and a fibrous coat, being at the same time filled with blood-corpuscles. The capillaries are composed of a single endothelial layer, which is separated from the adjacent reticulum by an extremely delicate light rim. They are either found empty or containing a few blood-corpuscles.

FIG. 1.

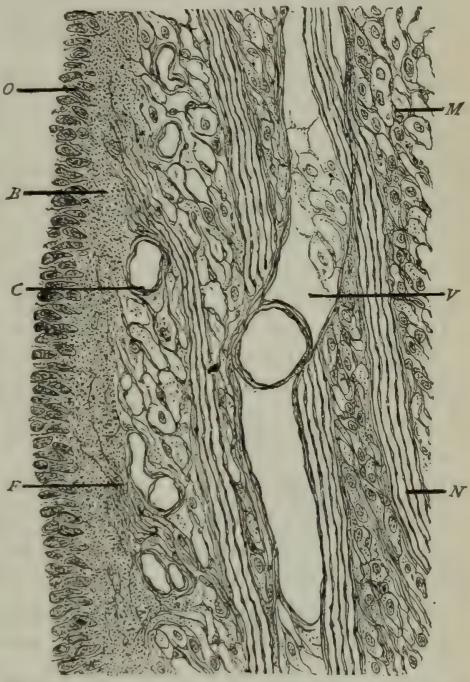

Fig. 1.—Segment of the pulp of a first molar tooth. Longitudinal section.

M, myxomatous connective tissue; *V*, vein; *C*, capillary blood-vessel; *N*, bundle of medullated nerve-fibers; *F*, terminal non-medullated nerve-fibers; *B*, bioplasson layer, containing the terminations of the nerves; *O*, layer of medullary corpuscles, termed odontoblasts. Magnified 200 diameters.

In longitudinal sections the medullated nerve-fibers show the well-known fluted double contour of considerable refraction (the sheath of Schwann). Inside of this is the myolin (nerve-fat) concealing the central axis-cylinder. Schwann's sheath exhibits delicate oblong or spindle-shaped nuclei, and external to this we observe a very delicate layer of fibrous connective tissue—"the internal perineurium." In cross-sections of the nerve-bundles a more or less circular group of medullated nerve-fibers is seen, each of which in its center exhibits the axis-cylinder in the shape of a roundish, glistening dot, the single nerve-fibers being separated from

one another by the delicate internal perineurium. Not infrequently capillary and arterial blood-vessels are met with between the nerve-fibers which, at the periphery of the bundles, blend with the nucleated sheath of the external perineurium.

As to lymphatics of the pulp, I can say that in some specimens I have seen branches of vessels of the size of veins without an adventitial coat, being composed of large, flat, slightly-protruding endothelia. These vessels I believe to be lymphatics, as they contained a finely-granular coagulated albumen, scanty granular corpuscles, and a very limited number of blood-corpuscles. As to the distribution of lymphatics, I must abstain from positive statements.

At the periphery of the pulp the delicate reticulum constituting the pulp-tissue is very dense, and its small meshes are supplied with numerous corpuscles looking like nuclei. In this layer we meet with only very narrow capillary blood-vessels. The outer surface of this layer is bounded by radiating rows of shining corpuscles of the size and appearance of nuclei. These rows are separated from one another in a longitudinal direction by light rims in which delicate fibrillæ can be frequently observed.

In chromic acid specimens stained with carmine, or, still better, in those treated with chloride of gold, high powers (1000 to 1200 diameters) reveal an extremely minute reticular structure pervading all formations of the pulp-tissue. It is this structure, that of bioplasson as well as basis-substance, that C. Heitzmann discovered in 1873. ("Untersuchungen über das Protoplasma, Sitzungs-Berichte der Kaiserlichen Academie in Wien.") Starting from the center of a mesh-space, we see a body like a nucleus, either homogeneous and apparently destitute of structure, or with the appearance of a vesicle with a distinct, bright wall. Inside the hollow nucleus we see a varying number of bright granules, interconnected with one another as well as with the inclosing wall by means of delicate filaments. Around the nucleus a minute light rim is seen, which again is traversed by radiating filaments connecting the nucleus with the extremely delicate, grayish reticulum pervading the light basis-substance contained in the mesh-spaces of the fibrous net-work. The delicate reticulum in the basis-substance is recognizable, even though the central nucleus be absent. The fibrous or bioplsason net-work which incloses the mesh-spaces also shows a delicate reticulum in connection with the nuclei at the points of intersection. Thus, all coarser reticular structures, as well as the fields of basis-substance, are traversed by an extremely delicate reticulum, which C. Heitzmann claims to be living matter proper. In this view I fully concur, and, so far as my experience goes, I would mention that inflammation in general, as well as that of the dental pulp, cannot be under-

stood unless the presence of living matter throughout all formations of bioplasson as well as basis-substance is admitted. It is this matter which grows and leads to a new formation, so strikingly shown in inflammation. I may add that fibrillæ of living matter are directly connected with the blood-vessels by means of delicate offshoots penetrating the light rim around the blood-vessels called the "peri-vascular space."

The formations at the periphery of the dental pulp termed "odontoblasts" by J. Tomes, and which by some observers have been considered as epithelial-like formations, under high amplifications exhibit the following:

Longitudinal fields, somewhat resembling epithelia, border the pulp in a radiatory direction. Such a field may appear in the shape of a finely-granular bioplasson or basis-substance in which there are imbedded oblong nuclei in varying numbers. The nuclei exhibit coarse granules and a dense reticulum of living matter, while the elongated fields inclosing the nuclei exhibit pale granules and a delicate bioplasson reticulum. Between these latter formations a delicate light rim is seen, wherein we observe sometimes broad, sometimes delicate, fibrillæ in connection with the reticulum of neighboring formations, accompanied by delicate conical offshoots, which penetrate the surrounding rims at right angles. In many instances these formations between the odontoblasts can be followed into the dentinal fibers, lodging in the midst of the dentinal canaliculi.

It is obvious, from what I have seen, that the odontoblasts furnish the matrix for the basis-substance of the dentine, whereas the dentinal fibers, being formations of living matter, originate *between* the odontoblasts. When studying secondary dentine I described and depicted a specimen corroborating this assertion (DENTAL COSMOS, Vol. XXI., p. 412).

The manner in which the bioplasson of the odontoblasts is transformed can be understood only on the basis provided by the researches of C. Heitzmann (*loc. cit.*), who claims that the liquid held in the meshes of the reticulum of living matter by a chemical process is rendered solid and glue-yielding, while the living reticulum itself remains unchanged, and merely becomes invisible because it has nearly the same refracting power as the basis-substance. Where the refracting power varies enough, the formations of living matter remain distinctly perceptible. Such is the case with the dentinal fibers and their transverse conical offshoots within the dentinal canaliculi.

In sufficiently stained chloride of gold specimens of a nine-months' fœtal pulp I have observed that the medullated nerve-fibers upon approaching the periphery of the pulp are destitute of their

myoline sheath, and now, being bare, axis-cylinders split into numerous extremely delicate beaded fibrillæ—the "axis fibrillæ." They are marked by a dark violet color, and run in the light rims between the rows of the odontoblasts near the pulp-tissue proper, and are connected with the odontoblasts by means of delicate conical offshoots. In some instances I have observed that these axis fibrillæ terminated in knob-like extremities. But whether the nerve-fibers directly anastomose with the dentinal fibers I am unable to say. That an indirect connection of the two is established by the intervening reticulum of living matter I positively assert.

Fig. 2.

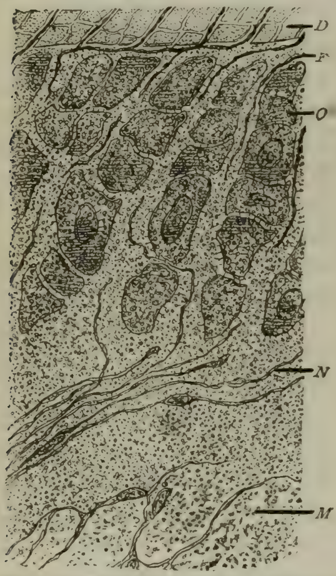

Fig. 2.—Segment of the pulp of a temporary tooth, stained with chloride of gold. *M*, myxomatous connective tissue; *N*, terminal non-medullated nerve-fibers, in a uniformly granular bioplasson layer; *O*, rows of medullary corpuscles, termed odontoblasts; *F*, dentinal fibers between the odontoblasts; *D*, dentine. Magnified 1200 diameters.

The results of my researches of the normal pulp are as follows:

I. The dental pulp is a variety of connective tissue termed myxomatous, representing an embryonal form of it. Pulp-tissue, therefore, is a remnant of embryonal tissue, lasting, in some instances, throughout life, and kindred to those formations termed "adenoid tissue."

II. The myxomatous tissue of the pulp is intermixed with a delicate fibrous connective tissue in varying amounts. Pulps entirely or nearly built up by fibrous connective tissue probably are not to be considered physiological.

III. The pulp-tissue is traversed by a close system of blood-vessels, viz.: arteries, veins, and capillaries. Arteries are not invariably found in the pulp, but they are by no means of exceptional occurrence. Lymphatics in small numbers are also present.

IV. The pulp-tissue is richly supplied with nerves, which, in the shape of bundles of medullated nerve-fibers, traverse the myxomatous tissue. Toward the periphery of the pulp they lose their myoline sheaths, become non-medullated, and, in the shape of minute beaded fibrillæ, branch between the odontoblasts.

V. The odontoblasts at the periphery of the pulp are elongated bioplasson formations with rows of nuclei. They are medullary corpuscles such as we see wherever a new tissue arises from a former one. They build up the basis-substance of the dentine by solidifica-

tion (transformation into glue, and infiltration with lime-salts). The reticulum of living matter traversing the odontoblasts remains unchanged in the basis-substance of the dentine.

VI. The dentinal fibers originate between the odontoblasts. Being formations of living matter, they are in direct connection with the reticulum of living matter—first of the odontoblasts and afterwards of the basis-substance of the dentine. The connection between the ultimate nerve-fibrillæ and dentinal fibers is very probably an indirect one by means of the intervening reticulum of living matter.

(To be continued.)

THE QUESTION OF UTILITY IN DENTAL EDUCATION.

BY. A. H. THOMPSON, D.D.S., TOPEKA, KANSAS.

It has become apparent that one colossal obstacle to the progress of the cause of the reform of Dental Education is the omnipresent "haste to be rich." Young men essaying to enter the dental profession seem to be actuated mainly, if not solely, by the desire to acquire an avocation which *appears* to be lucrative. It is needless to remark, perhaps, that this is a delusion from which they recover in after years, if they continue in the profession: but, be that as it may, it is a lamentable fact that such a misconception exists in the popular mind in regard to the compensation received for dental services, and young men casting about them for a means of livelihood are attracted toward it as a "paying business." This being the motive actuating application for admission to the profession, it is but a natural sequel that they should desire to be "put through" and equipped with all necessary (and no superfluous) knowledge, within the least possible period of time, to the end of "getting to work to make money." They will usually admit that a scientific education is a "good thing to have," but they "do not care for it," and only want to learn the "essentials"—and learn them quickly. They cannot afford the time and money necessary to obtain a good education. It is more frequently the time necessary to obtain a decent preparation that is objected to than the cost in money. This objection, backed by the indisposition to laborious study and mental effort necessary, prevents the elevation of the standard and the enlistment of capable and worthy recruits in our ranks.

This is all the outcome of the American epidemic rush after money, and the fanciful estimate of the value of money as a factor in human happiness, and the exorbitant money-value placed upon time. Young men now-a-days must be making a living for themselves, and even accumulating money, when they should, by rights, be searching and acquiring the knowledge of the past, and training the powers of the mind for real work. The ideas of the rising generation are all

commercial; knowledge is of no value to them if it is not immediately convertible into cash. The higher impulses—like the desire to serve their fellow-man, to relieve suffering, to acquire scientific culture for its own sake, to drill the raw mind for useful effort—and the possibilities of mental development and professional advancement, are all foreign to their minds when applying for enrollment in the dental profession. Their motives are not of the unselfish. Their maxim of life is that of the tradesman as well as of the robber, *i. e.*, "put money in thy purse." Mr. Ruskin has truthfully said that "it is impossible for a well-educated or brave man to make money the chief object of his thoughts; yet the healthy-minded man enjoys the honest winning of money, and will insist upon a fair remuneration for his work. But with all brave men the work comes first and the fee second, while there is a vast class, ill-educated, cowardly, and more or less stupid, with whom the fee is first and the work second."

But they do these things better even in the medical profession. Applicants for admission to its ranks do not contemplate it as a high-road to wealth, or as a despised means of obtaining necessary money. The veriest numbskull who aspires to be a "Doctor" knows well enough that it does not usually "pay" like any other ordinary occupation. His motive, like the most of those who enter the medical profession, of all grades of intelligence, to their credit be it said, is far more likely to be the acquisition of knowledge which will enable him to cure the sick, help the unfortunate, and earn professional honors. If he has selfish motives, if he seeks only pecuniary gain, these impulses are secondary to the higher and purer ones. The dental profession suffers by the contrast. It is rare, indeed, that a young man applies to us for admission because he wishes to attain scientific knowledge or professional honors, or because of his benevolent feelings towards mankind. It is because dentistry seems to "pay" well, and looks "easy and nice," in comparison with other occupations.

The question arises, Whom have we to thank for this state of things? We can reply directly that it is the work of the irregular or lay element of the dental profession. These *laymen* are to blame for all that is disreputable and unsavory in the popular conception of the profession. They scatter far and wide all manner of erroneous notions concerning the teeth and the dental profession. The lay practitioners take apprentices—most inappropriately misnamed "students," for they never read a book any more than their masters—and let them learn, by stealth or accident, to "fill teeth" and "make sets" in from one to six months or a year for a stipulated sum of *money;* these fledgelings are then turned loose to prey upon

the ignorant innocents and the "shoppers." The latter class does not demand much sympathy from the *profession*, but the fate of the ignorant innocent, who, meaning well, is deceived, calls for our sympathy and active interference. This custom of brief student apprenticeship by the lay element has created a popular notion that all necessary practical knowledge can be "learned" in a few weeks or months, and that any time required beyond this by us is a fanciful exaction, if not a larceny of the student's services. In this, again, the medical profession surpasses us, and is more fortunate. The medical applicant does not expect to be graduated in a few months. He has learned that the intending "doctor" must read medical books for years, attend lectures two or three winters, and engage in practice some time under a preceptor or in a hospital, before he can presume to practice alone. This impression is incalculably beneficial to the medical profession and the public. It keeps the number of irregulars and incompetents much below what it might be, even considering what it is. But with us the intendant notices that "dentists" seldom "study" long (too correct, perhaps), but get through studying and into practice much sooner than the "doctors," and, dentistry being a more "paying" business than medicine, he, naturally, as a financially-minded man, and one who is jealous of his time and labor, turns toward that which is most lucrative and least exacting.

The lack of apparent *pay* in a scientific education is the great source of the popular prejudice against it. Young men are pre-convinced that there is no need of it, that it is fanciful, ornamental, and superfluous, and when informed that a dental education requires as much time and study as a medical course, they are at first astonished, and then incredulous, and turn from us, either to relinquish the idea of entering the profession, or to go to a lay practitioner and learn easily and quickly. This is the experience of every well-meaning and conscientious member of the profession in dealing with many of the applicants for admission to our ranks.

Another powerful factor is at work counteracting the dissemination of the taste and desire for higher professional, as well as for higher literary and general, education in this country, *i. e.*, the pseudo-education, misnamed practical, of the common-school systems of the various States. The general principle of these is thoroughness in the "three R's" and a few branches which are considered essential to business and every-day life, and the acquisition of a little stock of miscellaneous historical information. The idea of the common-school system is that a little education is better than none at all, and that only those things are desirable which are useful in money-getting, and which contribute to profit, which is the end and aim

of education. So the child's time must not be wasted in the useless study of branches which do not contribute directly and visibly to money-making. The result is that the mass of the young men and women of this great nation are but half educated, or, rather, half crammed, and totally uneducated; they have acquired just enough of knowledge to inflate their ignorance and create a contempt for further study, and not enough to have reached the safety-line where they can look inwards upon their own ignorance and outwards into the illimitable and humiliating expanse of the unknown beyond They feel secure and complacent in their little, narrow, ignorance bounded world; consider themselves educated, and point with pride to their "diplomas" from "high-schools," presuming to be the peers of university men and the alumni of the oldest and most thorough institutions devoted to the highest education! These deluded creatures could be pitied but that our pity turns to alarm when we reflect that these half-educated young people constitute an immense proportion of the rising generation in this country, who will soon be upon the stage of action, and into whose hands will fall the control of the government, the business and the culture of this nation. This is a matter to make us think. Perhaps we may tremble for the future, even in the face of all the great promises of the present. Can we hope for great things of our future when persons arrogant with half-knowledge and weak with ignorance come into power? Of such material the men who do great things are not made. The common schools are styled the "Bulwarks of Freedom," the "Safety of the Republic," etc., but if they flood the land with semi-qualified men to crowd out those of higher attainments and disciplined minds,—the only ones fitted to govern and to lead,—the candid man must call their usefulness into question, and look upon their alumni with suspicion, if not alarm.

It comes about that these partially-educated young men, deluded by the ease and rapidity with which they have acquired an "education," appear at our professional doors and demand a still more speedy professional training. When we insist upon a scientific thoroughness and a tedious discipline, the ideas of these things are beyond their comprehension—a something foreign to their experience. It is a useless expense, in their estimation, the "pay" in it not being at once apparent. "In this," as Prof. Austen has well said, "in this lies the great error of American practical systems of education. They teach boyhood to take a utilitarian view of every lesson learned, and encourage young men to neglect studies in which they cannot see some prospective pecuniary value. It is the application to science and art of that philosophy of life which subordinates mind and body to the one idea of making a living, that spirit of trade which

regards classical study a waste of the years in which plastic youth can best be moulded into the mercantile idea of profit and loss. Limitation—first, in the amount of mental culture; secondly, in its direction—is thus made to combine with the inevitable influence of all exclusive pursuits, whether as science or business. The result is a rapid increase, in all professions, of men whose vision is limited by the narrow horizon of their special occupation, and who possess none of the large-minded liberality which is the outgrowth of a generous education. * * * The antagonism of trade and pure science is seen not only in the result of attempting to make all education utilitarian, but appears in professional life wherever the laws of barter come to be applied to brain-work and its products," etc. Young men "educated" (!) in the common schools, and there filled with the commercial ideas to which everything must become subservient, expect to be hurried through and be gotten to work, "for time is money," and they must be making the necessary cash. This is the best material that is offered the profession of to-day from which to create the dental profession of the near future, and the problem now is, How can we remodel it to make it serve the purpose?

At the outset we find ourselves confronted by these young men and their friends with the charge of the inutility of a scientific training. In the popular clamor for "practical" education there is no consideration for—indeed, there is no conception of—the value and utility of knowledge for its own sake, and of the need of mental exercise as a preparation for work. Persons of limited knowledge reason alone from experience. Their observation and knowledge of people and the world amounting to little or nothing, the need of more knowledge is, to them, inappreciable. They may be called the lowest class. A little above are those who sometimes feel the demand for more knowledge of their work than they possess. The members of a class a little higher read sometimes, and are willing to learn if it can be done without reflecting upon their ignorance. A step further we find a class who are willing to admit their ignorance, but who are unwilling to learn if it requires much effort. A step further we come upon dawning intelligence; a class who read considerably, but do not apply their knowledge, and are ever ready to criticise all things—especially change and innovation—from an ill-assorted stock of information. These classes are the conservative drags put upon the wheels of progress, and must be conciliated and counteracted in reforming dental education. They call in question all innovation and effort to improve upon the past, if it involves change. Conservative to a dangerous degree, they are proof against argument and appeal. If we would hope for success with them in advancing

professional education, it would seem that it must be done by compromise. If we listen to them, as we are obliged to do, we are put upon the defensive at once. Calling ourselves patriots, reformers, missionaries of dental education, we must meet people as they are, and deal with them as we can, laboring ever by force or compromise to advance the cause of dental education.

(To be continued.)

IMPROVED METHOD OF SETTING THE ALL-PORCELAIN TOOTH-CROWNS.

BY W. G. A. BONWILL, D.D.S., PHILADELPHIA, PA.

[Abstract of Remarks before the Brooklyn Dental Society's Clinic, March 13, 1882.]

THE numerous letters of inquiry received by me since the publication of my article on this subject in the DENTAL COSMOS for August, 1880, lead me to the recognition of two facts—first, that the said article was not as explicit as it should have been, having been too hastily written to meet the next issue of the journal, and that my meaning has been misapprehended by many; and, secondly, that the methods then described were not as perfect, and therefore not as satisfactory, as those which I am now prepared to lay before you. Although I had been working at porcelain crowns since 1871, first using the nut and screw, yet I had had no opportunity offered me by a manufacturer to place them before the profession. The demand which was created for the crowns by that article led to their production before the manufacturers had recognized all the necessities of the case, and they were not made correctly.

Besides some radical changes in the methods of attachment, there are various collateral advantages now to be availed of which were not then obtainable. The correct principle by which to shape the crowns is better understood by the manufacturers; a specially-adapted quick-setting amalgam has been prepared; a proper pin to meet all the requirements and a device for forcing the crowns into position are now furnished. The want of these things led to failure in many cases, but with such advantages as I have named there need be but few failures hereafter.

Many of the failures which have been reported to me were, however, the result of a disregard of instructions. Some attempted to set the pin into the root before the amalgam was inserted, expecting to be able to thoroughly pack it to the apex of the root in this way. Of course, they failed. Others have used gutta-percha instead of amalgam, which led to some failures. A good oxyphosphate cement comes next to amalgam, but is less valuable than the latter, whether for strength, cleanliness, or protection to the root.

Of all the modifications recommended by others for setting the

pin, that of cutting threads on the wire and in the root is the least desirable. There are various objections to this plan. It requires that the wire should be round, and of sufficient diameter to insure strength at the junction of the crown and the root; the canal has to be unnecessarily enlarged, and the strength of the root is thus lessened. It is by no means an easy matter to cut a female thread in moist dentine at the apex of a root; and drill and tap must be perfectly adapted to each other, or failure would result at best. A pin of sufficient diameter to give strength at the junction of the crown and root will be too large for the apex of the root, and if, to avoid this difficulty, a smaller wire is used, it will not have the strength required, and the thread will be likely to break when screwed home. Moreover, by this plan so much of the distal and mesial surfaces of the root has to be cut away to facilitate the packing of the amalgam that the root is unnecessarily weakened. The triangular pin formerly recommended, though better than the round wire, is open to the same objections. Other disadvantages of this method are that it meets a very limited number of cases, as where decay has already enlarged the canal (even here the apex of the root is likely to be unsound); and if, on account of the breaking of a crown, it is found necessary to remove the wire, it is almost impossible to get it out from the apex, and when done the thread in the canal is destroyed. To insure absolute success by this plan the wire must be of an exact size or the thread will be valueless.

A pin has been recommended of a conical form, with screw-thread, to be forced through the soft amalgam previously placed in the canal. The amalgam, however, would not be likely to remain in place while a screw was being turned round in it, but would be drawn away from the apex. Moreover, in most cases the pin has to be bent to suit special needs, which bending should be done before the pin is fastened in the root. A screw would not work satisfactorily after bending, and could not, of course, be bent after its permanent insertion in the canal.

It would be well if every one should set a crown on the root out of the mouth before attempting the operation in the mouth. A sectional thread can be made in the walls of the root to the very apex with a wheel-bur, and if after the amalgam has become hard the root be split, it will be found that the amalgam has been forced into every portion of it.

To solder a pin to a plate-tooth and pack gold or any plastic material around it in the root, or to fill the root with a plastic and force the pin up through it, is not a good method, and if the face of the crown should be broken—an accident liable to occur—it is no easy matter to remove the pin.

I have examined carefully the various methods of pivoting suggested by others, and believe that the plan which I here describe comes nearer to meeting all the needs than any other of which I have knowledge.

These all-porcelain crowns have three distinctive features,—a concave or countersunk base; a triangular opening from the base to a point at or near the cutting-edge of the incisors, the base presenting to the labial surface (at its upper portion this groove is enlarged); a peripheral margin or border resting perfectly flat on the root, the concavity of the base on the palatal side being at a much more acute angle than on the approximal sides. An anchorage is made in the incisors by a depression or under-cut between the labial and palatal surfaces, opening on the latter. In the bicuspids and molars the retaining-pits are nearer the grinding-surface.

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

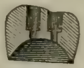

FIG. 6.

FIG. 7.

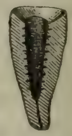

Fig. 1.—Sectional view of an incisor crown as now made, from mesial side, showing the under-cut at the point opening on palatal surface, the conical base, and the opening from the same to the retaining-grooves, with the exact relations.

Fig. 2.—Palatal view of same tooth. *a* is the external opening for egress of alloy and for packing around the pin. The dotted lines around *a* show the recess or under-cuts on the mesial and distal sides and near the point for retaining the crown, and its relation with the conical base.

Fig. 3.—Grinding-surface view of a superior molar with the countersunk pin-holes on the *buccal* and *palatal* sides.

Fig. 4.—Same view of an inferior molar with the pin-holes on the *mesial* and *distal* sides.

Figs. 5 and 6.—Sectional views of a molar and bicuspid crown, showing the countersinks and their relations with the conical base.

Fig. 7.—Sectional view of an incisor-root, showing the retaining-cuts made by the wheel-bur shown in Fig. 14.

It is not necessary that the face of the root should be flat; it may be either concave or convex. I hope we shall soon have the incisor crowns made with the labial edge convex, to run up under the gum and conceal the joint. The concave base of the crown prevents the amalgam from escaping under the heavy pressure exerted to force it into position, and in impacting the amalgam and expressing the mercury. It allows of a dense body of material around the metallic pin, giving the equivalent of a pin the whole diameter of the base of the crown. It leaves no joint, the crown and root being continuous. The amalgam is so thoroughly hardened at once by impaction in

the double concave of crown and root as to make a very firm operation. It prevents any possibility of the crown's twisting upon the pin and root. In the event of fracture of the crown, the convex surface of amalgam on the root makes the substitution of a new crown an easy operation. It enables the operator to fit the crown in much less time; it allows a proper position to be given to the pin,

FIG. 8.

FIG. 9.

FIG. 10.

FIG. 11.

FIG. 12.

FIG. 13.

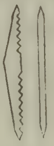

FIG. 14.

Fig. 8.—End view of a canal prepared for the improved combination-metal pin.

Fig. 9.—End view of same canal, as in Fig. 8, prepared for a triangular pin, showing how much more of the mesial and distal surfaces have been cut away from it than in Fig. 8 for the improved pin.

Fig. 10.—* Sectional view of an incisor crown and root, with the improved pin in its relative position to each, with the depressions made by wheel-bur.

Fig. 11.—Sectional view of a superior molar, with the large angular pin in palatal root and two square pins in the buccal roots, one being shorter and not passing through the crown.

Fig. 12.—Block of a molar and bicuspid, showing the countersunk holes for pins in the molar, and the hole in the mesial side of the second bicuspid where a pin is alloyed in and set into a decayed cavity in the distal surface of the first bicuspid, being held upon the molar roots and attached to the bicuspid by the alloy.

Fig. 13.—Side and end view of the largest size angular combination-metal pin with the stamped serrations. The square pins are without serrations and double-pointed, made of same metal and of equal thickness throughout.

Fig. 14.—The smallest-sized wheel-bur for grooving the canals for anchoring the pin and alloy.

with less danger of fracture therefrom; it permits of a larger quantity of amalgam in the crown, and is capable of bearing greater strain; it makes the permanent success of the operation probable, from the fact that it is absolutely jointless, and secures immediate solidity, even while the amalgam is semi-plastic. These crowns are capable

* The sectional views of the incisor and molar, giving the relative position of the pins in the crowns and roots, should show pins of larger size. The pins as furnished should be filed down but little. It is not absolutely necessary that so many serrations should be made in the canals by the wheel-bur for retaining the amalgam and pin as are shown in the sectional view of the root of an incisor. While there are no serrations shown in the roots of the sectional views of the molars, it is understood that all the canals must have the serrations. The square pins in the canal need no serrations. Just at the point where they occupy the countersink in crowns, make two or three very slight cuts on the edges with a sharp file. The ends can be left blunt.

of resisting the force of biting or mastication, because they are supported nearly to the cutting-edge or grinding-surface, the triangular opening from the concave base nearly to the cutting-edge allowing the pin to be imbedded in the labial face of the crown where there is the greatest amount of porcelain.

A round hole, as heretofore used without the concave base, would have its weakest point and relative strength through its center, making the palatal base responsible for its retention. For incisors this one improvement cannot be overestimated. A porcelain crown otherwise would be too uncertain. With this nearly the whole of the palatal surface could be cut away. Without such an opening the pin would not go far enough past the base into the point of the crown to make them secure. To rely upon the base for retaining any porcelain crown would be impractical, and much more likely to be immediately displaced before the amalgam hardened. The more acute angle of the base with the labial face is a marked improvement. There is seldom a necessity to give any further shape to the base as it now exists. The base should have its fine outlines preserved.

The pins, as now made, have marked advantages over the barbed triangular platinum pins. They are composed of a combination of metals which, while offering the greatest strength, allows the mercury in the filling to amalgamate the surface without injury to their substance; the pin is retained in the root without any serrations on its surface, which allows its easier insertion through the amalgam in the root. Serrations increase the size of the pin; are an obstruction to its passage through the amalgam; weaken the pin, making it more liable to break, and platinum will not amalgamate with the mercury. For these reasons I have long since abandoned their use. The size and shape of the pins I now recommend save time, have the greatest strength where the strength is most needed, and do not involve the cutting away of so much of the mesial and distal sides of the root, nor present any obstacle to the successful packing of the alloy around them. When the small roots of bicuspids and molars are to receive pins, square ones of a combination metal, without serrations, can be pressed up as far as desired. The irregular surface on the large angular pins is made when the pins are stamped, and does not weaken them as serrations do. They are rolled stiff and then stamped, thus securing the greatest strength. They admit of being placed at any angle, and if broken are much easier drilled out than a triangular serrated platinum pin.

The amalgam to be used as the medium of union must set quickly and be very hard. Thus far I have found nothing better than the alloys I have specially prepared for this line of work, and, though

they are costly, the superior results obtained by their use amply repay the cost. I use No. 1 generally. If mixed thick, it will set so quickly that the operator must work rapidly to prevent its being wasted. In incisor cases I use No. 3 at the gum line, and make a close joint.

The simple device which I have called an adjuster is a very useful adjunct in the operation. It requires considerable force to set one of these crowns according to directions,—a force which cannot be applied with a mallet without danger of loosening or displacing the crown. Steady pressure with slight rotation will carry the crown into place, if the amalgam is not too hard or there is not too much of it. I would advise you not to attempt to set a crown without one of these adjusters or its equivalent.

A crown can be mounted upon almost any root if the alveolar process has not been too much absorbed. In all cases the canal should be cleansed, and the foramen stopped with cotton or tin foil. If an abscess is threatened, drill an opening through the gum at the apex of the root. Of course, in an acute case it is safer to wait until the health of the root is established.

It is an advantage in every way to take an impression of the root, either with plaster or modelling composition, to get the size and shape of the crown. The articulation by a bite in wax is equally important.

Where much of the crown remains, the easiest way of cutting it off is to place a half-inch disk in the engine and cut through the enamel on the labial and palatal sides; then, with a spear-shaped drill, make several holes as close as possible in the groove, and with a small fissure-bur run them into one. It will easily break at this line. If the patient expose the gum much in speaking or smiling, the root may be cut down with the bur or corundum-wheel beyond the free edge to conceal the joint. With bicuspids and molars it is not necessary to go below the gum; a joint well made will not be observed, and the strength of the root will be preserved. If the root is decayed below the gum, after removing the softened parts, fill it with alloy; if it be split or have very thin walls, a platinum band can be made separate from the crown. This will seldom be necessary, as the pin, anchored high up in the root, will be its equivalent.

In preparing the canal, use first a small-sized, spear-shaped drill, carefully following the natural channel. Then follow with a larger one, taking care not to cut through the root near the apex. On the mesial and distal sides cut away but little, as there is where fractures are most liable to occur. The canal can be very tapering and yet hold the pin, if the undercuts or grooves are well made all along the walls from the apex out. There need be but very little space

around the pin. The mouth of the root should be countersunk the same as the base of the crown, in order that the amalgam may extend to its very edge, leaving no dentine exposed. The smallest-sized wheel-bur may be used to make an interrupted female thread at various points along the canal to hold the amalgam. By all means save all the walls of the root possible. The face of the root may be flat or concave, according to indications. In most cases it had better be flat.

The crown to be inserted should be inspected closely, as the retaining undercut in the incisors and the depressions in the bicuspids and molars may not be well defined. If not, the crowns are liable to work loose. If the base has been ground off in fitting, the edges should be beveled again to a fine margin with a corundum-point. The crown should be fitted to the root in the mouth, not to the plaster cast. The articulation should be clear, to avoid displacement. The pin should be as large as the previously prepared canal will admit. The pin must in every case be fitted, and in fitting it file only on the plain sides. The serrations in the large pins need not be touched. Leave the end sharp, to offer the least resistance in passing through the amalgam. The end of the pin to be passed into the crown needs very little alteration. The crown being open on the palatal surface of the incisors, permits a blunt-pointed pin to go up to its place. The middle of the pin should not be interfered with if it can be avoided. It is well to cut the pin a little short for incisors, as it may not get pushed entirely up in the root through the amalgam. The small square pins are used in the bifurcated roots of bicuspids and in the buccal roots of molars. They can be sharpened at both ends, but the outer end will not require so much sharpening. The palatal roots of molars will generally take one of the largest thick pins, with one square pin in the largest and most accessible buccal root; in both, if the canals can be reached to prepare them. Each canal should have a pin, even though one has to be so short as not to pass through the hole in the crown. If it enters the countersunk base it will support the root. The lower molars will require two of the largest-sized thin pins. As the support of the root is dependent upon the size of the pin and the depth to which it is inserted, the single-rooted teeth should have the very largest thick pin. If the root is thin on the mesial and distal sides, the thin, angular pin is to be preferred. When the pin is thoroughly set it is hard to fracture the root. The crown should go on easily and correctly over the pin, special note being taken of the position of the latter in the canal, so that it may be returned at the same angle. Ordinarily these large pins do not have to be bent. If necessary, it had better be done with a hammer, and before the

mercury touches them. The pin should have free movement in both root and crown. Should it be discovered that the pin is too long after it has been packed in the root, it can be cut off with sharp forceps, pressing them up against the pin to prevent displacement. It can be sharpened subsequently with the corundum-wheel.

To insure an amalgamation of the pin with the filling, brighten the surface of the former before inserting. In the buccal roots of molars the pins need not be inserted more than a quarter of an inch, or even less, in some cases.

The roots, crown, and pins being in readiness and arranged on the table, so that no mistake may occur from getting the pin in the wrong position, and the appliances necessary for the operation being at hand, the alloy preferred should be mixed a little thinner than if intended for a filling, especially where the root has a long canal. The shorter the canal, the thicker the amalgam may be mixed. Mix only enough at one time for one root. Put enough amalgam in the canal to nearly fill it, but do not pack it; force a steel pin made for the purpose, of about the same size as the pin, to make way for the easier insertion of the latter. Then grasp the pin with suitable forceps, and carefully but steadily press it up to its destination. If you cannot succeed in doing so, remove it, and again use the steel pin. When in place, use an instrument with a point small enough to pass between the pin and the root, and pack by tamping the amalgam around it. A piece of bibulous paper placed over the point of the instrument will assist materially in carrying the amalgam before it. Before the amalgam has become too hard, replace the crown to determine if the pin is in proper position; if not, it can be crowded to one side or the other with the tamping-tool. Should the pin be found to be rather long, it can be ground off with the corundum-wheel, holding it meanwhile with the forceps. No attempt should be made to bend the pin after it has been amalgamated, for fear of breaking it. If any amalgam has been left, and it is still plastic, it may be packed around the pin at the base of the root, using the bibulous paper as before directed. If not, mix again to complete the operation. Bank up the amalgam on the root high enough to fill the base of the crown. The crown should now be tried on, and forced home with an adjuster adapted to the case, removing the surplus amalgam if too much, or adding if not enough. Remove and dry the crown, and fill up simply the undercut cavity near the cutting-edge if an incisor, or the depressions in the crowns of bicuspids or molars, allowing a very little to extend into the cervical base. Now force it home with the adjuster. Free mercury will be squeezed out on the palatal surface, which should be wiped off. Now hold the crown in place with the fingers, with the bibulous

paper under the tamping-instrument, and consolidate the amalgam around the point of the pin in the crown, absorbing any free mercury which appears there. The excess of alloy at the joint must now be removed, care being taken to press the crown up while this is being done. The amalgam packed around the pin in the crown on the palatal side should be as stiff as may be to work readily. It is well to leave over some of the first mixing for holding the pin, and this will be about right for consolidating about this point.

If in a bicuspid or molar crown the pin should come so far through as to interfere with articulation, it may be ground off with the corundum-wheel while the crown is firmly held.

The case can now be dismissed, with directions for the patient to return the next day, in order to make sure that the articulation is correct and to dress off the joint between the crown and root, which may be done with a small round-headed bur.

There are some cases in which the root cannot be filled with anything; if in a molar, the pulp-chamber can be relied upon to hold a headed pin or pins. When a tap-hole is required in the root it can be made low down and at an acute angle, and the amalgam packed around the root-canal above the tap.

Should an artificial crown be broken, another can easily be substituted, by burring off any excess of amalgam, and using fresh amalgam, mixed thin, to allow of ready adjustment.

Lower incisor roots, which have hitherto been abandoned to the forceps, can be crowned by this process.

The nut and screw process, as described in the Dental Cosmos for August, 1880, is now of but little value. It might be preferred in cases of irregularity, where the root is far out of position, but even here this new crown can be used in conjunction with the nut and screw without backing up a plate-tooth, or where two crowns are to be placed on one root by metal connections.

Two crowns can be inserted on the root of one large molar with the assistance of the decayed approximal surface of an adjacent tooth. (See Fig. 12.)

These crowns can be used for rubber or celluloid. In special cases, where plate-teeth have to be backed with gold and attached to rubber, they are beautifully adapted, and if one is broken another is easily substituted on the old pin. A heavy metal pin is packed into the rubber and passed partially or entirely through the crown, to which the crown may be vulcanized at once or afterwards cemented on.

For repairing celluloid or rubber or continuous-gum work, these crowns serve a useful purpose.

THE AMALGAM QUESTION.

BY J. FOSTER FLAGG, D.D.S.

(Continued from page 242.)

It now remains for us to inquire into the object of such papers as that of Dr. Talbot and such editorials as that of Prof. Watt, and the "ways and means" by which this object is sought to be attained.

For twenty or thirty years past dentistry has been divided into two factions, the one, a *large* one, claiming prominence, and indeed *pre-eminence*, upon the ground of a demonstration of superior manipulative skill. To be an elegant filler of teeth with gold was to be an "eminent" dentist. This position has its peculiar strength, and certainly is entitled to *all it deserves*, but another faction, a *smaller*, and a constantly growing one, has been restless under this jeweler-like presentation of a profession which they believed, under broader views, held at its bestowal an untold amount of relief to suffering humanity. As I have said, and as is well known, the opponents to the according of "eminence" to *mere manipulation* are now so numerous that the "balance of power" is beginning to be a question of much moment, and it can therefore be only in the interest of the weakening cause that such efforts are made.

Why *must* this be so? It must be so because at the earliest date of inquiry into the plain question of the "saving of teeth" it was at once recognized that the opinion of the committee of 1841, as to the possibility of filling with gold all teeth that were capable of being rendered serviceable in any way or by any material, was the most unmitigated nonsense, for there were then monuments of nearly ten years' duration in the shape of "hopeless," "worthless" teeth saved by amalgam. Thus it was shown that teeth could be saved by amalgam which even the "most eminent" manipulators could not save with gold. It was this *fact* which placed amalgam solidly as the antagonist of gold; it was this fact which has made those who have rested their claim to "eminence" upon their ability to work gold *fear amalgam.* They have affected to despise it, but no one who truly despises a thing heaps upon it constant invective; nothing which is despised is persistently defamed and decried; nothing which is despised is maligned and abused intolerantly. All this has been done and is yet done to amalgam, and the result is *that "the use of amalgam has increased until now tons are consumed yearly in filling teeth!"* It is well worth the strongest effort of the antagonists to amalgam that this tidal wave should be stayed in its progress, for it truly threatens their annihilation!

That gold will be "abandoned" as a filling-material is not and never has been the idea of the advocates of amalgam, but that it is

unwisely and disadvantageously used, even yet, with all the marked modification which is now manifest, *is* the opinion of the advocates of amalgam. Why is this antagonism especially against amalgam? It is because no other filling-material possesses the *resistant* characteristics which pertain to amalgam—nothing else can compete with gold—nothing else can successfully compare with gold—nothing else can do, *as amalgam can*, MORE than gold! This is why the narratives of "debility," "dyspepsia," "ptyalism," "paralysis," and "broken-down, prematurely old men" are periodically dispensed at society meetings and in the dental journals. If it were not for this, cockroaches, guinea-pigs, and sensitive plants would live on in peace and quiet.

Who ever heard of such calumniation of gutta-percha?—even of red base-plate!—full of the sulphuret of mercury! It is promptly eaten out from articulating cavities; it cannot restore contour to teeth; and therefore, although in protected cavities in *soft* teeth it has repeatedly outlasted the best gold efforts of the best gold-workers, it is quietly alluded to as "a temporary material." Who ever heard of such calumniation of oxychloride of zinc? Nay, more, who does not know of the wholesale acceptance and laudation of this wonderful (!) filling-material? So *easy* to mix; so *easy* to introduce; so *easy* to finish; so like the teeth in color!—so *desirable* in every way; so *fortunate* a possession in cases of *frail* teeth!

Was it the "feeble" men, who said all this? Was it the "lazy" men, who periodically discussed this boon to humanity? Was it the "poor quacks," who were so well satisfied with the "Diamond" and the "Adamant" cements? Diamond! Adamant! Names which none but the most unscrupulous would affix to such evanescent compounds—materials which no worker of amalgam would ever indorse. And yet, the *strong* men, the *energetic* men, the *skillful manipulators*, the *hard workers*, the *eminent* men, the *reputable* practitioners, all who hated amalgam and who worshipped gold, have cried out with a loud voice, "Great is oxychloride of zinc!"

So also has it been with the oxyphosphates and the nitrophosphates, and, judging from precedents, we have the right to assume that it would ever be so with any and all materials which *truly* could not compete with gold.

None such as these have ever been denounced as "demoralizing" to the profession; the use of materials such as these has never been regarded as "degrading" even by the "most respectable." They have been "plastered" in far more *like plastering* than has been amalgam, but the term "plasterers" has never been thought applicable, much less *appropriate*, for bestowal upon these "elegant operators." They have never for a moment thought of regarding the use of

such materials as infringing, even distantly, upon the domain of gold, or as in the least degree comparing with it in value, beauty, or permanence. Gold-work has had no fear of such competition, and experience has proved that if it had had, all such fears would have been utterly groundless.

With amalgam all is different; it has been found to be a compound singularly adapted to the requirements. It is easy to mix, as much so as the zinc plastics; it is easy to introduce, as much so as the zinc plastics; it is easy to finish, as much so as the zinc plastics—and so far, reasoning from analogy, all would be well. But now come *serious difficulties!* It can not only be introduced with facility, without the necessity for rubber-dam infliction, without the consumption of very much time, without the pain and irritation incident to prolonged malleting or hand-pressure, without the subsequent tedious and disagreeable filing, pumicing, tape-finishing, and burnishing (all of which might still be well enough), but, unfortunately, it is very durable, very tooth-saving, and, worst of all, *not very expensive*. From these three considerations, it is very "demoralizing!"

A few trials of amalgam by those who have vainly expended a vast amount of patience, strength, and skill, in years of honest, faithful endeavor to save soft, sensitive teeth with gold, give results which force the experimenters to indulge in serious thinking as to their *duty* towards those who place themselves in their professional keeping.

A few trials of amalgam by those who have given time, endurance, and money, without stint, to that which has proved a series of unsuccessful experiments in the endeavor to stay the ravages of caries and the frequent loss of teeth, shows them, so conclusively, the *folly* of continuing in the old way, that amid satisfaction, contentment, and outspoken joy at the demonstration of prospective comfort, they indulge in sarcastic comments upon the elegant efforts of "eminents," and cover with bitter invectives the memory of the useless torture and the wasted time and money which has, *until now*, been their ideal of dentistry!

It is strange, indeed, but no less strange than true, that all the power which the acknowledged "*leaders*" in the dental profession could bring to bear for the prevention of a fair, open, honorable, and unbiased trial of amalgam has been essayed. Sneers as to incapacity on the part of men who were daily *saving* just such teeth as the scoffers were *extracting* have been liberally indulged in by those whose *highest dental ability* was that of sticking gold together piece by piece. Invidious comments, refusal of recognition, denial of respectability, and *absolute proscription*, are the weapons which have been used against such as *arrogated* to themselves the right to try experiments which seemed to promise comfort, satisfaction, and

reasonably permanent tooth-salvation, even in most desperate cases!

It seems hard to credit this; it *might* seem harder yet to give a reason for it; but that it has been so is indisputable.

And for patients, that *they* might not indulge, it has been deemed advisably professional that fearful tales of dyspepsia, nervous prostration, mercurial ptyalism, and paralysis should be related to them *ad nauseam!*

What is the result of all this powerful, systematic, official antagonism? What is the result of all these horrible bug-bear narrations? I will take the answer to these questions from Dr. Talbot's paper: "*The use of amalgam has increased until now tons are consumed yearly in filling teeth!*"

Dr. Talbot quotes Professor Chapin A. Harris, who in his *opening* address to the *first* class of the Baltimore College of Dental Surgery in 1840 said of amalgam, "It is one of the most objectionable articles for filling teeth that can be employed, and yet, from the wonderful virtues ascribed to this pernicious compound by those who used it, thousands were induced to try its efficacy."

And now, after *forty years* of additional experience, what is the result of this earnest, faithful, *scientific* teaching?

It has proven so eminently objectionable and so diabolically pernicious that, at first, the thousands who were induced to try its efficacy were only able to induce some tens of thousands to accept the benefits of its "wonderful virtues," but, as years rolled on, and the solidity of Prof. Harris's teachings became more incontestably established, the recipients of the benefits to be derived from this "most objectionable" and "pernicious" compound came to be counted by the hundreds of thousands!

By this time, as might reasonably have been expected, the cases of nervous prostration, mercurial ptyalism, paralysis, and death, had become so alarmingly numerous and so well authenticated that *millions* have rushed forward to immolate themselves before this dental Juggernaut, and "*tons* of amalgam are now consumed *yearly* in filling teeth!"

And now, in truth, who has seen all, *or any*, of the direful sequences which have been ascribed to this "objectionable," "pernicious" compound?

Dr. Talbot states that he is "in possession of numberless cases of poisoning from mercury in amalgam fillings."

To old experimenters, experienced observers, and *statisticians* this seems, at first, a peculiarly loose and unscientific statement, but, upon slight reflection, it becomes far less unreasonable, for, if Dr. Talbot had been possessed of only 1000 cases—a very large number for any one record—it would have been easy to have so stated it, and

the cases would have been by no means "numberless." If he had been informed of 100 cases, that record would have been larger, by far, than any other observer has collected, and ought to have been regarded with favor—and yet *a hundred* would have been even less "numberless." It is hardly to be assumed that he would have regarded 10 cases as "numberless," and we are therefore left with only 0 cases, which may, with perfect propriety, be regarded as "numberless," and which, indeed, is the only *number* of cases which any statistician could accept as "numberless."

From this stand-point I, too, can say that after an experience of twenty-five years' extended use of amalgam fillings I am in possession of *just exactly* "0" cases of complicated mercurial, dyspeptic, ptyalistic poisoning or paralysis, and "0" cases *even of death* from mercury in any form.

From analogy we might reason that a like experience with mine at the hands of several thousand dental practitioners may have had *something* to do with the *increase* of the use of amalgam, for it is hardly fair to assume that so large a proportion of the members of so progressive a profession as dentistry has proved itself to be, ought to be ranked as "feeble, lazy quacks."

When the sewing-machine was invented it was inveighed against most bitterly as *ruinous* to the *poor* women and *injurious* to the *rich* purchasers, but as year after year developed the truth in regard to them the sale and the utilization of them increased "*until now tons of them are consumed yearly*" in response to the demand.

When coal-oil was offered as an illuminator, ruin was proclaimed alike for whalers, lard-oil makers, and camphene manufacturers, and it was held up in holy horror as dangerous to limb and life, and as not even a good material with which to kindle fires! But truth developed "*until now tons of it are consumed yearly*" in response to such varied demands in the behests of comfort that it has come to be one of the largest interests.

Even "envelopes"—so mild and placid in their exterior and general physical characteristics—were antagonized as detrimental to prosperity and "ruinous" to seal-makers and sealing-wax manufacturers, but the former and the latter alike continue their elegant and useful occupations, while the sale of envelopes has steadily increased "*until now tons are consumed yearly*" in their manifest aid to celerity and comfort in the routine of social and business duties.

So has it been with amalgam, as year by year it has defiantly, and with greater solidity, put under foot the vague assumptions and false assertions of its antagonists. Steadily has it maintained its onward and upward march, vindicating its capabilities, asserting its claims, and demonstrating its merits, "*until now tons are consumed yearly in*

filling teeth," and imbecility, laziness, and quackery labor with increasing cheerfulness in the Christian-like work of comfortably and satisfactorily saving the human teeth.

(To be continued.)

A REPLY TO MY CRITICS.

BY DR. M. H. CRYER, PHILADELPHIA, PA.

In the March and April numbers of the Dental Cosmos I find criticisms on the report of a clinical lecture given by me at the Philadelphia Dental College.

The first critic seems to have made six points; the second one two,—the latter, however, being included in the first. I will therefore take up these objections one by one, and hope by so doing to satisfy both writers.

1st. Objection is made to the claim that the making of an artificial denture with a band, and single gum teeth soldered to a gold plate by means of stays, requires more skill than does the filling of cavities with gold, and that to learn this so-called mechanical dentistry takes ten times as long as to learn to fill teeth with gold. The critic claims that his father, more than forty years ago, made gold plates as artistically as they are made to-day, and says that it has taken the best men of the profession, with all their ingenuity and application, these same forty years to bring filling with gold to its present state of perfection. He does not seem to catch the idea advanced in the report, that both the making of artificial plates and the filling of teeth with gold are *mechanical*. Both branches are mechanical,—one having to do with the manufacture of a plate to be worn in the mouth, while the other is the insertion of a filling to be worn in a tooth. One requires skill in one direction, and the other requires skill in another direction. The claim is that making a plate requires the highest degree of skill, while the filling can be done by almost any moderately intelligent operator. To define what is meant by a properly-constructed gold denture, *i. e.*, such an one as was referred to in the clinic, the plate must be so perfectly adapted to the mouth that it can be worn at all times with comfort. It should adhere so firmly that it shall not be liable to displacement in speaking, sleeping, laughing, coughing, or in masticating food. The general appearance of the teeth should accord with the age, temperament, and sex of the wearer. The joints between the teeth should be perfect, and each tooth should be well fitted to the plate, so that no spaces shall intervene. The stays and bands should be so neatly made that there shall be no pockets or places to retain particles of

food or other matter. All this requires more than mere imitative ability. Each case is a new problem, far more intricate than filling a tooth with gold. For one skilled in plate-work, to learn the mere art of filling teeth with gold is an easy task, but skill in the latter direction avails but little in the making of plates.

Even granting that the constructing of artificial dentures is merely imitative, the question arises, What must be imitated? Nothing less than nature herself, and no one can deny that such imitation demands both skill in art and science in the adaptation for use in speech and mastication. The prosthetic dentist must conceal art in order to be perfect; must restore the natural form and expression of the face; must avoid modifying articulate speech; must be a close observer of nature, so as to read in the sunken muscles the harmony of features that formerly existed, and by his skill restore that which was peculiar to the individual. In this high sense it may be granted that prosthetic dentistry is imitative. It is the experience of those who teach mechanical dentistry that much more time is required to properly learn plate-making than to learn to fill teeth with gold. Of the fillings and plate-work made by students of the three colleges in this city for graduating specimens, the fillings are invariably better than the plate-work. There is not one first-class plate-worker for every twenty good gold-fillers.

It is a very doubtful assumption that for the past forty years the best men of the profession have spent all of their ingenuity and application in learning how to fill teeth with gold. Many of them have been teaching other things, such as treatment, and the best materials to fill the different classes of teeth with.

The student has been told that his future patients will differ temperamentally and physically, and that the treatment and filling-material proper for one may be the very worst for another.

Those who have spent all their ingenuity in learning how to fill with gold, and gold *alone*, without regard to the texture of the teeth or conditions of the general system, have destroyed and will continue to destroy more teeth than they will save, and thus they are instrumental in bringing into requisition the services of the tooth-extractor, and his ally, the plate-worker. Such are those who persevere in the blind use of a capping-material which they admit resulted in failures for twenty years before it occurred to them to abandon it.

2d. It is objected that it is risky to seal up with cotton and sandarac varnish "any" cavity from which a dead pulp had not been entirely removed, but a careful perusal of the report will show that nowhere was anything said or done which justified the critic in assuming that such practice was taught.

3d. The critic considers filling roots with cotton bad practice. It was not intended to give the idea that *all* roots are to be filled with cotton, though it is recommended in many cases. There are many roots that should be filled with gold; some with a low-heat gutta-percha; but there are very few, if any, in which oxychloride of zinc should be used, for reasons which are apparent. Root-canals are generally best treated when stopped in such a way that they are perfectly air- and water-tight. Any root that can be well opened up with an instrument may be stopped solidly with cotton, gold, or gutta-percha, but curved canals can be most thoroughly stopped with cotton. An oxychloride stopping, even where the canal is perfectly clear almost to the apical foramen, is difficult to insert properly, will shrink in setting to such an extent that moisture will frequently find its way along the sides, and, finally, it is almost impossible to remove it should the tooth need treatment in later years. Actual experiment with teeth out of the mouth shows it to be almost impossible to fill root-canals with it perfectly. Natural cotton (not the absorbent), if moistened with oil of cloves or carbolic acid and tightly packed, is impervious to moisture. A bale of cotton dropped overboard and allowed to remain in the water for months will be found dry when opened. Cotton dressings have repeatedly been taken from canals after years of service, and they have been found in the same condition as when inserted. It has been the experience of some of Philadelphia's best dentists that oxychloride is the worst root-canal filling that can be used.

Having lately removed several oxychloride root-fillings put in by other dentists, it may be stated that they were, in every case, at the upper part of the canal, found to be soft, disintegrated, and very offensive.

4th. The critic asks why the pulp was destroyed in the right upper cuspid after the inflammation had been reduced with acetate of morphia and carbolic acid, and adds that it seems to him wrong to teach the destruction of pulps unless they are hopelessly diseased. Further, he does not wonder that the lecturer shrinks from trying to save pulps if oxychloride is used for capping. He says he tried it for twenty years without success, unless an intermediate material was used, and speaks of oxyphosphate as a desirable non-irritant and reliable capping. First, the pulp *was* hopelessly diseased. While far from declining the effort to save exposed pulps by capping, all such cases require discretion and judgment. Because this pulp was comfortable while narcotized with carbolic acid and morphia, was no reason why it would remain so after the influence of the narcotics had passed away. It was, from its pathological condition, certain to give trouble sooner or later. The practice of intelligent

operators is to devitalize if the pulp is much exposed and has been highly inflamed, especially if the tooth has been well hardened and no longer needs the nutrition supplied by that organ. Much has been written of pulp-conservation; some have even gone so far as to claim successful treatment of pulps by cutting away diseased portions, poulticing, etc., but great faith and some charity are required in order to the acceptance of these claims. The rarity of success in such cases is admitted even by the practitioners themselves. Oxychloride of zinc as a capping in certain cases (not in all, by any means) is indorsed by such men as Professors Smith and Darby, and frequent successes by others have confirmed their teachings. Gutta-percha has its place, as spoken of in the clinic. Oxyphosphate has been abandoned as a capping because it is believed to slowly devitalize the pulp, and this is followed by putrescence, periodontitis, etc.

If a pulp die under oxychloride, it is very often found to be mummified, while this is not the case where oxyphosphate has deen used. Oxychloride, through its stimulating qualities, will cause, in many cases, the formation of secondary dentine, but such is not the case with the oxyphosphates. It is acknowledged that several considerations govern the capping of a pulp, such as extent of exposure, seriousness of the congestion, general systemic condition of the patient, sex, age, occupation, history of the case, former results in other capped teeth, or in teeth where the pulps have been devitalized in the same mouth, etc.

5th. The critic prefers to anchor his gold fillings by means of retaining-points, and censures the use of grooves and pits merely for starting and fastening the first pieces of gold. Pits are merely to start the filling, not to retain it as a whole. He claims four advantages for retaining-points over under-cuts,—saving of time, less pain, removal of less dentine, and less liability of having a blue line around the edge of the filling. Time is a small object where good work, reputation, and the patient's comfort are at stake. It has been common for patients to complain more during the drilling of pits than during the cutting of grooves or under-cuts, for the first must necessarily be made much deeper than the latter in order to be of value. Thus, the amount of dentine removed by number and depth of retaining-points is certainly equal to that excavated by extent of groove or under-cuts, to which may be added the danger of approaching the pulp, and also the possibility of splitting the tooth by the wedging of gold into these drilled holes.

As for the blue line referred to, the objection is scarcely worthy an answer, for it can only result from an imperfect adaptation of the gold to the walls of the cavity.

6th. The critic takes exception to the sentence, "The first few cylinders should not be annealed," and says he prefers to anneal most carefully the first gold placed in the starting-point, desiring especially that no movement of the gold should take place from the very first. Unannealed first pieces are no more likely to move than annealed, since they have the advantage of being comparatively soft and easily adapted wherever wanted, by slight pressure, while the annealed requires greater pressure. When only a very thin stratum of dentine covers the pulp in a deep cavity, even if a capping be used, the unannealed is more readily adapted, and with less pain.

PROCEEDINGS OF DENTAL SOCIETIES.

FIRST DISTRICT DENTAL SOCIETY OF NEW YORK.

The regular monthly meeting of the First District Dental Society of New York was held at the rooms of The S. S. White Dental Manufacturing Company, corner of Broadway and Thirty-second Street, on Tuesday, February 7, 1882, Dr. Wm. H. Atkinson in the chair.

In behalf of the Clinic Committee, Dr. C. F. W. Bödecker made the following report:

Dr. E. P. Brown, of Flushing, L. I., presented a gentleman for whom he had restored the eight upper and lower front teeth with gold. The teeth had been worn away by mechanical abrasion, and were built up or down respectively about one-eighth of an inch. The anchorage, as Dr. Brown explained, was obtained by drilling a number of small holes near the boundary of the dentine and enamel with a Morse drill, which, while in motion, was rotated, thereby obtaining a slight undercut, and at the same time beveling the edge of the little drill-hole. The eight upper teeth were prepared, filled, and finished in one day—nine hours. The lower ones were done in two days, but in the same number of hours. Dr. Brown stated that the rapidity with which these operations were performed was due to the employment of the electro-magnetic mallet in packing the gold. With but one exception all the pulps were alive, and the patient had experienced no annoyance from sensitiveness by thermal changes. The fillings looked magnificent in every respect.

Dr. G. F. Reese presented a patient with a very nicely-fitting partial lower set, made by him of his gold-alloy base. The patient pronounced the plate to be exceedingly comfortable and serviceable.

Dr. S. C. Spooner showed three teeth built up with gold, out of the mouth, for which a gold medal at the American Institute of 1874 had been awarded.

Dr. Starr, of The S. S. White Dental Manufacturing Company, exhibited a very ingeniously constructed automatic electric vulcanizing regulator.

Dr. Hunter filled two left upper bicuspids with gold. In the mesial surface of the second there was but a small cavity, but the first bicuspid was considerably decayed, involving the distal and grinding surfaces. The pulp had been removed. The upper part of the nerve-canals (about one-third) was filled with gutta-percha, and the rest with No. 4 "One-Quarter of a Century" foil. The remainder of the cavity was filled with No. 20 foil, using the lead mallet.

Dr. Marshall H. Webb operated on the left upper second molar, a pulpless tooth with the whole anterior approximal and a good portion of the masticating surface missing, all the other teeth on that side of the mouth being in position. There had been such therapeutic treatment as was necessary to allay pericementitis, and all obstruction to return of the surrounding tissues to normal condition was removed. The decomposed pulp-tissue had been taken out of the roots of the molar, and each root was temporarily filled with cotton, and the cavity of decay with gutta-percha, some months before. The opening in each buccal root had been very carefully followed up and slightly enlarged with a delicate Gates drill. At this clinic, after the rubber-dam had been applied, narrow strips of light gold foil were carefully placed in each root from the apical foramen to the large or bulbous portion of the pulp-chamber, which was then filled with oxychloride of zinc—Agate cement. In applying the rubber-dam the operator took a piece of light-medium rubber, about eight inches square, and cut five holes in it, two of them a little larger than the others for the first and second molars. He then applied the Delos Palmer clamp "l. s. 7" to the second molar—the "left superior seventh" tooth from the median line; stretched the rubber-dam over both the clamp and tooth; brought the rubber forward over the first molar, each bicuspid, and the cuspid, these being the five teeth for which the holes were made. A ligature of waxed floss-silk was then placed in position and tied at the neck of the first molar and that of the cuspid. This having been done (the operator doing all of it alone in less than five minutes), the edges of the rubber were carefully folded and held out of the way by a rubber-dam holder, and the patient made more comfortable by the placing of a fine napkin under the rubber next the lips, chin, and cheeks. All was now ready for the operation, and the parts were quite accessible as well as dry. While the cement in the bulbous portion of the pulp-chamber was hardening, the preparation of the cavity was completed and sufficient anchorage for the filling made, the margins of the cavity were cut even and smooth, the cusps taken off almost

an eighth of an inch, and the whole of each remaining wall—buccal, palatal, and posterior approximal—was otherwise trimmed, slightly beveled, and prepared for the gold with corundum-wheels. When the cavity was thus prepared, and a good medium-sized starting-point had been made in the dentine in line with the palatal root at the edge of the cement, the filling was commenced and the grooves were filled with No. 30 foil. Most of the operation was carried forward with No. 60 gold, each piece of foil used being passed over the flame of an alcohol lamp, making it as cohesive as possible, and passed into the cavity by an assistant. The gold was put in place and made compact with the electro-magnetic mallet attached to a freshly-charged four-cell Bunsen battery. After the starting-point and a portion of each groove had been filled, and as the narrow strips of foil were being placed along the cervical wall, or over the edges of the cavity, an observer could scarcely fail to notice how easy it seemed not only to put the gold compactly and safely in place over such margins with the electro-magnetic mallet without puncturing the rubber-dam, but also to trim away the surplus material from the edges wherever such trimming was required. The whole operation was now carried steadily forward with but little labor till the contour was fully restored, including the covering of the buccal, palatal, and posterior edges of the crown to almost an eighth of an inch, and the building down of each cusp with gold in one solid mass. A little over two books of one-eighth of an ounce each, or about one hundred and twenty-eight grains of gold, were used in the filling, and the insertion of the same and the restoration of the contour, including the trimming away of the surplus material and the shaping of the crown with the electro-magnetic mallet, as the work was progressing, required about two hours and ten minutes. This operation did not cause pericementitis, though the pressure of the ligature and the clamp induced slight inflammation of the lower part of the pericementum and gum surrounding the neck of the tooth.

Dr. Marshall H. Webb afterwards read the following paper on "Filling Pulp-Chambers:"

By opening through the crown of a molar or other tooth each pulp-chamber can be made accessible. Where death of the pulp has just taken place, or in those cases where the tissue has not become putrescent, the apical foramen should be closed with gold as soon as the bleeding has ceased, exudation of blood usually following the rupture of the vessels at and removal of the pulp from the end of the root. Gold ought to be used for closing the foramen, for the reason that narrow strips of light foil can be put in place with the certainty of having the air in the pulp-chamber pass out alongside of the piece of foil as it is carefully moved toward the end of the

root. The accurate measurement of the length and diameter of the pulp-chamber (which measurement should be taken just before introducing the gold) can be more strictly observed in closing the foramen with foil than in the introduction of oxychloride of zinc or gutta-percha. When, also, foil is placed as near to the end of the root as possible without passing through the foramen, the gold, when carefully and solidly put in place, entirely prevents fluids from entering the pulp-chamber, and this is the most important point about, and almost the entire object in, filling pulp-chambers. If the foramen be not properly closed, the filling of pulpless teeth cannot well be otherwise than unsatisfactory, and the operation an almost useless one. When a small broach can be passed to the end of a root, even there the foramen can be closed with gold. The pulp-chamber should first be thoroughly cleansed, and the foramen then closed with light gold foil folded once upon itself, or made into three or four thicknesses, and cut into very narrow strips. Cotton is the next best material for the filling of pulp-chambers. The cotton should be moistened with carbolic acid, and a few fibers at a time be then carefully placed in position at the foramen, and so solidly packed as to prevent infiltration of fluids from the end of the root. It can thus be carried to the foramen easier than if saturated with oxychloride of zinc. It is sometimes necessary to take a fine drill and carefully enlarge the pulp-chamber, but it is better to fill to the end of the root without the drilling. After the dead pulp has been removed and its chamber properly prepared for filling, the foramen should be closed with gold, and then, and not till then, the pulp-chamber can be safely filled with oxychloride of zinc instead of gold, and the operator can be quite certain to get this material to the gold at the end of the root, and get the air out at the same time. The foramen being closed with gold, the oxychloride of zinc cannot pass through to the end of the root any more than fluids can thus enter the pulp-chamber. It is well to use oxychloride of zinc in this manner instead of gold in some cases (as in those where the pulp has remained dead in its chamber for some time, and where an abscess has been formed), for the reason that the chloride of zinc coagulates the protoplasm, and prevents or arrests the decomposition of the ends of the fibers in the dentinal canaliculi. In closing the foramen each narrow strip of foil should be taken on the end of a suitable packing-instrument and placed near the end of the root, and then tapped carefully with a light hand-mallet till the feel and the sound of the instrument indicate that the gold is placed solidly in position. There is less liability of getting gold through the foramen against or into the tissues outside the end of the root by tapping the instrument with a mallet than by placing the foil in position by pressure.

In the treatment of pulpless teeth, and especially those wherein the pulp has been dead for some time and abscess is in its incipiency, or where it has gone on to such an extent as to prevent rebuilding of the tissues surrounding the end of the root, it is sometimes necessary to carry a small drill just through the foramen so as to make a fresh wound, and secure healing by first intention without inflammation or suppurative action. Japanese bibulous paper, carefully wound upon a broach of suitable size, should be used for drying out the pulp-chamber and applying remedial agents. Liquid weeping through the apical foramen should be examined with a magnifying-glass, and if the parts of the paper can be clearly seen through the fluid, such fluid is protoplasm from the elements of the tissues about the end of the root. A little deliquesced chloride of zinc ought to be carried to, but not beyond, the end of the root to coagulate the protoplasm, when the foramen should be closed at once with gold, and the entire operation may then be completed. If the surface of the paper on the broach cannot be so clearly seen through the fluid after withdrawing it from the pulp-chamber, pus may be looked for, and further treatment will be required. In cases where the foramen is so large that it cannot without great difficulty be closed with foil, a gold wire should be fitted accurately by measurement in the end of the root, and be carefully put and held in position with oxychloride of zinc; after which the whole pulp-chamber should be filled with the cement. After closing the foramen in each of the roots of molars and filling the greater part or the whole of the chamber in each root with gold, it is best to fill the bulbous portion of the pulp-chamber and a part of the cavity of decay with oxychloride or oxyphosphate of zinc. When this material has hardened, sufficient anchorage ought to be made for, and the operation completed with, gold. When it is necessary to use the pulp-chamber for anchorage, as in cases where the greater part of or the entire crown is to be restored with gold, each root, as well as the bulbous portion of the chamber, should be filled entirely with cohesive foil, made solid throughout by the use of the mallet. In most cases the gold in the pulp-chamber can thus be made as strong as wire, and, because of the more perfect adaptability of foil, better anchorage is secured.

KANSAS STATE DENTAL ASSOCIATION.

The annual meeting of the Kansas State Dental Association held at Topeka, commencing May 2, 1882, and lasting three days, was a meeting of unusual interest, and brought a better attendance than for several years.

The following officers were elected for the ensuing year: L. P.

Meredith, president; A. M. Callahan, first vice-president; A. Doud, second vice-president; J. D. Patterson, secretary; A. H. Thompson, treasurer.

J. D. PATTERSON, *Secretary*, Lawrence, Kansas.

ALABAMA DENTAL ASSOCIATION.

THE third annual meeting of the Alabama Dental Association was held at McDonald's Opera House, Montgomery, Ala., April 11, 12, and 13, 1882, the president, Dr. G. M. Rousseau, in the chair.

The following officers were elected for 1882: J. C. Johnston, president; W. G. Robertson, first vice-president; A. Eubank, second vice-president; E. Wagner, secretary; G. M. Rousseau, treasurer; Drs. J. C. Johnston, E. Wagner, A. C. Walker, W. D. Dunlap, and E. S. Chisholm, executive committee.

E. WAGNER, *Secretary*, Montgomery, Ala.

PENNSYLVANIA STATE DENTAL SOCIETY.

THE fourteenth annual meeting of the Pennsylvania State Dental Society will be held in Williamsport, Pa., commencing July 25, 1882, at 10 o'clock A.M. Session will continue three days.

Dentists having special cases available, either in operative, mechanical, or surgical clinics, will please inform the committee at once. Persons having new inventions or improvements that are of interest to the profession will please notify the committee, who will make arrangements to have them properly exhibited.

A full programme will be published hereafter.

G. W. KLUMP, *Chairman of Com.*, Williamsport, Pa.

The Pennsylvania State Dental Examining Board will meet at the same time and place during the session of the State Society for the examination of applicants, who are required to show specimens of work in both the operative and mechanical departments.

C. N. PEIRCE, *Chairman*,
1415 Walnut Street, Philadelphia.

AMERICAN DENTAL CONVENTION.

THE American Dental Convention will convene in Saratoga Springs, N. Y., August 8, 1882. The Committee of Arrangements will give a detailed notice in the July number of the DENTAL COSMOS.

A. C. RICH, *Secretary*, Saratoga Springs, N. Y.

KENTUCKY STATE DENTAL ASSOCIATION.

The Kentucky State Dental Association will hold its annual meeting in Louisville, commencing Tuesday, June 6, 1882, at the rooms of the Polytechnic Society. Dentists of Kentucky and neighboring States are cordially invited to attend.

Chas. E. Dunn, *Secretary*, Louisville.

NORTH CAROLINA DENTAL ASSOCIATION.

The North Carolina Dental Association will hold its eighth annual meeting in Salem, N. C., commencing Tuesday, June 6, 1882. The Board of Examiners will meet at the same time and place. Applicants for license will please take notice. Reduced rates for delegates have been secured on all the railroads.

W. H. Hoffman, *Sec'y*, Charlotte, N. C.

CONNECTICUT VALLEY DENTAL SOCIETY.

The Connecticut Valley Dental Society will hold its summer meeting at the Amherst House, Amherst, Mass., June 29 and 30, 1882, commencing at 11 o'clock A. M.

An interesting programme may be anticipated. Dr. J. L. Williams, of North Vassalboro, Me., and Professor R. R. Andrews. of Cambridge, Mass., among others, are expected to contribute to the exercises.

Per order of Executive Committee,

A. W. Ross, *Secretary*, Chicopee, Mass.

MASSACHUSETTS DENTAL SOCIETY.

The seventeenth semi-annual meeting of the Massachusetts Dental Society will be held at Codman and Shurtleff Hall, No. 167 Tremont Street, Boston, Mass., on Thursday and Friday, June 8 and 9, 1882, commencing at 11 o'clock Thursday morning.

W. E. Page, *Secretary*, 110 Tremont St., Boston, Mass.

EDITORIAL.

A DENTAL DEPARTMENT IN THE UNIVERSITY OF MARYLAND.

We have to record the establishment of another dental school. The University of Maryland, Baltimore, Md., has added a Dental Department to that institution, the Legislature of the State having recently passed an act conferring upon its Faculty of Physic authority to grant degrees in dentistry.

The following gentlemen have been appointed as the Faculty in the new Dental Department: Ferdinand J. S. Gorgas, M.D., D.D.S., professor of the principles of dental science, dental surgery, and mechanism; James H. Harris, M.D., D.D.S., professor of operative and clinical dentistry; William E. A. Aikin, M.D., LL.D., professor of chemistry; Samuel C. Chew, M.D., professor of materia medica and therapeutics; Francis T. Miles, M.D., professor of physiology; L. McLane Tiffany, M.D., clinical professor of oral surgery; J. Edwin Michael, M.D., professor of anatomy; John C. Uhler, M.D., D.D.S., demonstrator of mechanical dentistry; Frank L. Harris, D.D.S., demonstrator of operative dentistry; Randolph Winslow, M.D., demonstrator of anatomy, and six assistant dental demonstrators.

All of the professors, with the exception of the two first named, are members of the present Faculty of Physic of the University. Drs. Gorgas and Harris have until recently been connected with the Baltimore College of Dental Surgery, the former having been its dean for many years.

The regular session of the new department will commence on October 2, 1882, and continue until the first of the ensuing March. The summer course of practical instruction commenced on the first of May, and is to continue until the opening of the regular session.

CHANGES IN THE BALTIMORE COLLEGE OF DENTAL SURGERY.

Professor R. B. Winder has been elected dean of Baltimore College of Dental Surgery to succeed Professor Gorgas, who, with Professor Harris, has resigned from the faculty.

Dr. M. Whilldin Foster has been elected to the chair of pathology and therapeutics, and Dr. James E. Lindsay to the chair of chemistry.

The announcement of the college will be found in the advertising pages of the Dental Cosmos.

OBITUARY.

CHARLES ROBERT DARWIN, LL.D., F.R.S.

Died, at his residence, Down House, Orpington, Kent, England, April 19, 1882, Charles Robert Darwin, LL.D., F.R.S., in the seventy-fourth year of his age.

Dr. Darwin was born at Shrewsbury, England, February 12, 1809. His reputation as a naturalist was established shortly after he attained his majority. He has contributed to literature many and

valuable treatises on a variety of scientific subjects, but the most important of his writings was "Origin of Species by Means of Natural Selection." His more recent works have been devoted to the supplying of data in support of his conclusions with reference to the doctrine of Evolution, or, as it has come to be familiarly termed, "Darwinism."

It is safe to affirm that the influence of Dr. Darwin's ideas has been recognized not only by the scientific world, but by thoughtful men in almost every department of intellectual activity. He has, doubtless, done more than any other man in modern times to revolutionize the thought of the civilized world concerning man's relations to the physical universe, and his name will live in history as one of the most scientific thinkers and inquirers appearing in the annals of the human race.

FRANK H. COBURN, D.D.S.

Died, at his home in Nashua, N. H., April 15, 1882, of abscess of the bowels, Frank H. Coburn, D.D.S., in the twenty-third year of his age.

Dr. Coburn was a graduate of the Boston Dental College, and valedictorian of his class. He was held in high esteem in his profession, and was considered by all an upright and honorable young man. His thoroughness in his profession and courteousness to all won for him a paying practice. His loss is sincerely mourned by his class-mates and friends. S. W. W.

PERISCOPE.

The Disorders of Primary Dentition.—There is no fact more generally recognized in infantile medicine than the influence exercised by dentition on the general health of children. "A fine child, until it commenced to cut its teeth," is not alone a familiar saying; the experience of the greatest physicians has proved its truthfulness. In all the best works on infantile pathology, both ancient and modern, the influence of dentition is regarded as indisputable. But it must be admitted that this doctrine has been, perhaps, carried too far; the best clinical observers have been obliged to protest against the assertion of many who would attribute most of the diseases from which children suffer to the influence of dentition. This protest is evident in the works of Rilliet and Barthez, in the clinical lectures of Trousseau, the treatise by Bouchut, and in Dr. West's remarkably practical book. None of these practitioners desire to exaggerate the rôle of dentition in the etiology of infantile diseases; but its influence in this respect is not contested or denied. It is, in fact, an opinion current in medicine since the days of Hippocrates, and confirmed by Sydenham, Haller, Hunter, and the cotemporary authors we have already cited. However, certain voices have been lifted against this

generally received opinion. After showing that dentition has been accused of producing many disorders not referable to it, which is perfectly true, certain authors have denied that teething has any influence in the production of morbid phenomena.

M. Magitot, whose authority on any subject connected with the teeth cannot be denied, has particularly combated the commonly received opinion. In his work on the disorders attending the eruption of the teeth, published in the *Archives de Médecine* in 1881, he seeks to prove that dentition has no part in the production of the disorders imputed to it, and that these disorders are merely coincidences. He recalls the opinions of Rosen, Andral, and Trousseau, that great caution should be used regarding the disorders of dentition, an opinion carried much further in the works of the distinguished English dentist, Mr. Tomes. We will consider, later on, the arguments brought forward by M. Magitot to sustain his opinions. To commence with, it seems to me useful to consider the question under three principal heads:

1st. Should we admit, in certain cases, the existence of a difficult, laborious dentition, and if so what are the characteristic signs?

2d. Can this difficult dentition induce disorders proper to this condition, and characterized by their nature, course, and duration?

3d. When a child is teething, should all the maladies which may present themselves be laid to the influence of this physiological act?

These different questions do not appear to me of difficult solution. Dentition is a physiological act, but not necessarily accomplished, on that account, without pathological reaction.

Children who pass through the period of primary dentition without presenting any symptoms of suffering constitute veritable exceptions.

The incisors and the first molars often pierce the gums without provoking any very marked reaction, but the eruption of the second molars, and particularly of the canine teeth, generally causes much more trouble. The phenomena which accompany the eruption of the teeth have, with reason, been divided into local and general. The most common local phenomenon is salivation, and this is the more remarkable as the buccal mucous membrane in young infants is generally dry, as Dr. West has rightly observed. At the moment when the gums become swollen and the crown of the tooth becomes prominent through the thinned surface of the gum, then the infant constantly drivels, and wets several handkerchiefs in a few hours, which does not happen with a child before the fifth month. This exaggerated secretion of saliva can only be explained by the excitation transmitted to the salivary glands along the mucous membrane of their ducts.

If the irritation is more marked, and the child very impressionable, the hands are carried incessantly to the mouth, and the infant bites at and rubs against the gums any hard object within reach, particularly objects which communicate a sensation of cold. At a more advanced stage of irritation aphthæ are developed and thrush may supervene. The gravest manifestations of the irritation produced by dentition constitute what has been called odontitis infantum, characterized by a veritable stomatitis with ulcerations, which may persist so long and determine so much suffering as to give rise to

great anxiety for the life of the child, although West has never observed any case where these disorders actually caused death. In the presence of such symptoms it is difficult to deny the possibility of local disorders induced by dentition. We admit that these grave symptoms are rarely observed, but Trousseau, Guersant, West, Rilliet, and Barthez mention them, and their occurrence cannot be placed in doubt. It is not, however, on this point that the principal objections have been formulated, but against the disorders affecting the general system and imputed to dentition. It is, in effect, impossible to deny, with any appearance of reason, the existence and etiology of the local disorders, with which every physician is acquainted; but when we are in presence of disorders such as diarrhea, skin eruptions, convulsions, fever, etc., which present nothing special, then it is less difficult to deny the influence of dentition, and pretend that the occurrence of these symptoms at this period is a mere coincidence, that these may be observed at any period of infancy, and that they are attributed, without any sufficient proof, to the effect on the general system of the process of teething. Nevertheless, no physician who comes frequently in contact with sick children hesitates in recognizing these evidences of constitutional disturbance as due or referable to dentition,—not in all cases, but in certain conditions of daily observation.

Reflex sympathetic phenomena are manifested in infancy with peculiar energy, of which we have daily proof; agitation, fever, vomiting, and convulsions are often induced by slight but constant sources of irritation, such as a badly-placed pin or a boil irritated by the contact of dry and hardened dressings. How, then, can it be denied that a continuous pain in a swollen gum, which persists and cannot be relieved, may throw the infant into a condition often exceedingly distressing?

Since the application of a blister or sinapism often determines convulsions in a nervous child, why should the continuous irritation of dentition be incapable of producing the same symptoms?

It is true our opponents seek to establish that this pretended pain of dentition is purely mythical; that there is no reason why the eruption of the tooth should cause pain, since there is neither effraction nor traumatism, but a very gradual wearing away or absorption of the tissues of the gum. It would then be necessary to prove and demonstrate that the different tissues pushed outward and compressed during the evolution of the tooth do not suffer in any way from this compression, which it would appear exceedingly difficult to admit.

When a vigorous child of from six to eight months, nursed by a healthy mother with excellent milk, is suddenly observed to lose sleep and gaiety, become irritable and quit the breast after a few attempts to nurse, while at the same time it drivels incessantly; when, again, after a careful examination of all the functions, no explanation can be found for this change, except that the gum is hot and painful when touched, it must necessarily be admitted that the process of dentition has caused these disorders. A few days pass, the general malaise persists, or is augmented in intensity; diarrhea may come on without any change in the habitual diet of the child. No active treatment is instituted, and yet, all of a sudden, the mor-

bid symptoms disappear, and examination of the gum shows that the eruption of the tooth is complete. Can the conclusion, then, be other than that we have already formulated?

This is not a case invented for the occasion, but a fact of daily observation; with some children even the eruption of each tooth or group of teeth is attended by these morbid symptoms.

If these facts are not constantly observed, they are at least common, and it is certainly very rare to find a child who has not suffered more or less during the period of dentition. I have observed, for my part, a child who never had one of his first twenty teeth without suffering from one or several convulsions, and who has never presented any since the period of dentition.

What we have said of the fever, diarrhea, and nervous disorders, can be repeated with equal justice for the multiform eruptions frequently observed in similar cases. There is nothing special to distinguish these eruptions, any more than the intestinal or nervous disorders, from those produced by other and widely different causes. They demonstrate, however, the existence of disorders in the functions of the various organs, and in the secretions, produced by dentition.

What especially characterizes these eruptions is the period of their appearance and the manner in which they follow "the evolution of the teeth, preceding and accompanying the eruption of a group of teeth and then disappearing."

If all the morbid symptoms observed during dentition cannot be ascribed to this physiological act, it is not the less true that these disorders, appearing only at this period, accompanying the eruption of the teeth and ceasing when this is accomplished, do not leave in doubt their veritable causation.

It may be admitted that dentition is not an isolated phenomenon; that it coincides with a period of peculiar activity in the development of the child, principally with the formation of the bones, the increase of the glandular system of the digestive apparatus, and that at this moment the nervous sensibility is at its highest pitch.

This is all true, but it is certain that dentition, particularly when painful, has a preponderating rôle in the causation of these morbid manifestations.

After denying that teething can be of itself painful, M. Magitot demonstrates that traumatisms practiced on young animals at the period of dentition, and affecting more or less deeply the gum or the tooth, do not determine anything comparable to the disorders attributed in children to the evolution of the teeth.

We are of opinion that there can be no analogy between the sections, punctures, and tearing of the alveoli in these experiments, and the normal evolution of the tooth, which separates, forces out, and slowly compresses the tissues. This last is a purely vital act, not in any manner reproduced in the traumatisms already mentioned, which induce widely different reactions.

In the same way the numerous diseases of the teeth, caries, ulcerations, etc., may often induce very severe pain without provoking any symptom resembling those observed during the period of the evolution of the teeth. The reactions are peculiar to this period, and are analogous to those observed during the evolution of other organs.

The opinions of M. Magitot are reproduced in the able and con-

scientious thesis presented by M. Levèque to the Paris Faculty. We have particularly considered the seven observations given by M. Levèque, and we find that several might be given as types of the disorders induced by dentition, and the interpretation of them given by the author is, to say the least, extremely far-fetched. But these objections do not mar the value of the work; it is possible that the author will persist in his ideas if he practices dentistry exclusively. But it would be entirely different if he is called upon to follow, in their maladies and indispositions, young infants, to have them under his care during their development, and be obliged to interpret their sufferings. He would then remark, with all clinical observers, that dentition exercises a very marked influence in the production of infantile disorders, and he would soon recognize how solidly the opinion he combats to-day is established.—*Lecture by M. Blanchez, Hôpital des Enfants Malades, Med. and Surg. Reporter.*

On the Presence of Bile in the Saliva.—Dr. Samuel Fenwick read a paper on the presence of bile in the saliva, and on the variations in the amount of sulphocyanide of potassium in the saliva of persons affected with different diseases. The author commenced by stating that it is generally believed that in cases of jaundice the saliva does not contain any of the coloring-matter of the bile. He has, however, found a yellow coloring-matter in the saliva of every case he has examined, after evaporating it by means of a gentle heat. A bitter taste is often complained of by patients affected with jaundice, and it has been suggested that it might result from the presence of the biliary acids in the saliva. The author has not been able to prove whether this opinion is correct or not, but he details a case in which an intense bitterness was complained of by a person unaffected with jaundice, in whose saliva he found traces of the biliary salts by the ordinary tests. Having proved that both the coloring-matter and the salts of the bile occasionally presented themselves in the saliva, an attempt was made to ascertain whether the amount of the sulphocyanide of potassium usually present in the saliva varies in different diseases, and whether such variations coexist with any particular diseases. For this purpose, the saliva was examined in a large number of patients treated in private and hospital practice, and the results were afterwards analyzed. As it had been stated by some physiologists that the sulphocyanide was only the result of decomposition set up in the saliva by decayed teeth, and by others that it was produced by tobacco-smoking, these two conjectures were first examined. The state of the teeth was carefully remarked in eighty-seven hospital patients, and it was found that there was no relation between the amount of decay in them and the quantity of the sulphocyanide in their saliva. The habits of 213 persons were inquired into respecting their use of tobacco, and it was found that the amount of the sulphocyanide was not affected by the habit of smoking. The quantity of sulphocyanide was almost always deficient in cases of jaundice arising from obstruction; thus, of twenty-three cases, it was very deficient in eighteen, and in some scarcely a trace could be found. From this the author conjectures that the amount of this salt in the saliva depends on the quantity of the bile that reaches the intestines, a conclusion that seemed to be supported by

two cases of hepatic fistula, in both of which it was also very deficient. Where jaundice was absent, one of the chief circumstances that appeared to regulate the amount of the sulphocyanide was the quantity of food taken by the patient; thus, it was always deficient in œsophageal stricture, and in cancer of the stomach. Persistent vomiting, diarrhea, and dysentery produced a similar result, probably by removing the food before it could be fully digested. It was also deficient in cases of severe atonic dyspepsia, and in all cases of chronic disease where the appetite was very bad. The sulphocyanide was found to be in excess in fat persons and in those who were gaining flesh; deficient in those who were thin or rapidly losing weight. It was greatly in excess in all cases of acute rheumatism (thirty-six cases examined), and reached the maximum in the second week of the disease. It was also in excess in all the cases of acute gout, and in most of the persons liable to what are termed "bilious headaches." In the early stages of all inflammatory disorders there was an excess; for instance, in gastric catarrh, in acute pleurisy, erysipelas, diseased kidneys, and in phthisis; but it sunk below the average in the latter stages of these diseases. The author points out that the fibrin of the blood has been found to be in excess in most of the above diseases, such as acute rheumatism, gout, erysipelas, and acute inflammations, and he suggests that an unusual amount of sulphocyanide in the saliva is perhaps the consequence of an excessive excretion of unoxidized sulphur, resulting from the large amount of albuminous material of the blood that has been altered by the inflammatory process, and thereby rendered unfit for organization into healthy tissue.

Dr. Marcet said little was known of the sulphocyanides in the saliva. They were only known by their chemical reaction, and had never been isolated. This, however, was useless for clinical purposes, where the color-tests must suffice. Dr. Fenwick's observations were numerous and reliable. Sulphocyanide seemed to have some relation to digestion though what that was no one seemed to know; perhaps it also partook of the nature of an excretion.

Dr. Fenwick said the quantity of sulphocyanide in the saliva was so small that color-tests could alone be used. It was only by collecting a great number of cases that any light could be thrown on the subject.—*Proceedings of Royal Medical and Chirurgical Society, Med. Times & Gazette.*

HINTS AND QUERIES.

"He that questioneth much shall learn much."—Bacon.

Correspondents desiring a reply in this department are requested to make use of *distinctive signatures or initials*, and avoid the practice of signing their communications Reader, Subscriber, etc.

Correspondents who wish notice to be taken of their communications should authenticate them with their names. We cannot insert queries or replies except they are so accompanied. Names not necessarily for publication.

Replantation.—A somewhat novel case of replantation of teeth and bone occurred in my practice recently, and, as the time which has elapsed since the accident has brought about a successful result, I take pleasure in sending the facts to your journal.

The patient, a child seven years of age, fell from a swing on January 16,

striking her face against the door-post. The mouth being open, the external parts were simply bruised. The right upper central, which was just erupting, was torn from its socket and turned backwards towards the soft palate. The palatal portion of the process was broken and carried back with the tooth, although separated from the same. The apex of the tooth rested against the upper lip, and the anterior aspect of the bone and gum presented a terribly bruised and lacerated appearance. Chloroform was administered by the family physician. The operation consisted in removing the gum-tissue and broken fragments of bone from the labial portion of the maxilla, which had not united with its fellow. A portion of the process, about three-quarters of an inch long and one-half as wide, had been turned back toward the palate-bone and severed from the erupting teeth. This piece of process and the tooth were pressed into place, and a splint of pink gutta-percha was pressed over the entire arch. The lower teeth were pressed into it, and a Garretson bandage placed about the jaws. This, however, had to be removed in the course of two hours to permit the expulsion of the contents of the stomach, the child having eaten a hearty dinner before the accident. The bandage and splint were retained in position three days, when ether was administered and both were removed, as the gum was suppurating slightly. A new splint was formed and pressed into position, and the anterior aspect of the root of the central was left exposed to the apex. A weak solution of salicylic acid in glycerin and carbonate of potash was directed to be applied every three hours. This prevented further suppuration, and the case rapidly progressed toward recovery. The splint was held in position sixteen days, and then a ligature was substituted, which was worn about ten days. Seeing the patient every few days, as the tooth and bone were rapidly becoming firm in position, all appliances were removed and nature left to complete the cure.

Two months from the time of the accident not a trace of the injury remains. The gum is completely closed down to the cervix of the crown, the tooth firm and strong, with no indication of death of the pulp, which was not drawn out of the root at the time of the operation.—D. E. PETERSON, D.D.S.

IN answer to Isaac Hills, in the February number of the DENTAL COSMOS, I will state that *sugar* acts on decayed teeth purely as a powerful irritant—probably due to the acid reaction that is undergone when it is brought in contact with the human saliva. The lactic acid thus formed naturally evolves heat, irritating the pulp of a tooth even if not exposed. As to the coagulation of the albumen of the *dentine*, I cannot venture to explain whether it is the sugar by its *alcoholic* principle or the lactic acid (both will coagulate albumen) which causes pain. My practice of washing out the cavities of teeth with alcohol, where the pulp is not exposed, has demonstrated to me that in the process of coagulation there is *heat;* and this gives pain, for as soon as I direct the patient to hold some water in the mouth the pain ceases.—A. C. B., Havana, Cuba.

HOW TO PREVENT DARK JOINTS.—Take No. 4 or 5 tin foil, cut into strips an inch wide; fold three times, and cut this into pieces corresponding to the length of the gum. After the cases are separated and the wax all removed, take the short strips of folded tin and place one end securely between the pivots of the adjoining blocks to hold it securely in place, extending the other end up and over the top edge of the gum, with the flat side against and over the joints. This prevents the rubber from being forced through the joints (which should be made as tight as possible), and the tin does not discolor in vulcanizing. It is worth a trial.—S. G. ROBERTSON.

THE

DENTAL COSMOS.

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ORIGINAL COMMUNICATIONS.

THE MINUTE ANATOMY, PHYSIOLOGY, PATHOLOGY, AND THERAPEUTICS OF THE DENTAL PULP.

BY C. F. W. BÖDECKER, D.D.S., M.D.S., NEW YORK, N. Y.

(Read before the New York Odontological Society, March, 1882.)

[Continued from page 299.]

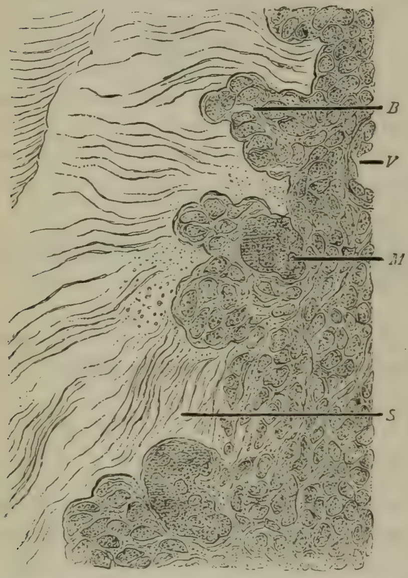
The Pathological Conditions of the Pulp.

Pulpitis.—I have examined a large number of specimens of pulpitis, but have not met with this process except in pulp-chambers more or less reduced in their caliber by a new formation of secondary dentine. I do not want to say that pulpitis never occurs without this preceding formation, but to me it seems quite probable. In caries of dentine, or in mechanical or chemical abrasion, long before the pulp-cavity is approached, we have known, since the time of John Hunter, that, corresponding to the lost portion on the outer surface of the tooth, secondary dentine is deposited in the corresponding direction within the pulp-chamber. Evidently in pulpitis caused by a sudden and severe irritation the production of secondary dentine is induced before the irritation becomes sufficiently high to develop inflammation. If pulpitis does occur without the previous formation of secondary dentine, it must be a rarity. Where primary dentine is invaded by the inflammatory process, traces of secondary dentine scattered along the pulp-chamber are visible, and the probability is that the secondary dentine to a great extent has been destroyed by the inflammation before the primary dentine was reached.

As I have published in the Dental Cosmos, Vols. XXI. and XXII., my researches on the formation of secondary dentine and pericementum, and on pericementitis, in the light of recent investigations on inflammation, etc., I shall have to say but little on pulpitis. The main characteristic of this process is the appearance of a large

number of inflammatory or medullary corpuscles in the pulp-tissue. These corpuscles, the same as in pericementitis, arise from the living matter present in the bioplasson formations as well as from that hidden in the basis-substance. Where before a fibrous reticulum was visible, containing in its mesh-spaces basis-substance with central nuclei, in the earliest stages of inflammation numerous bioplasson bodies are seen, either closely packed together in heaps or separated from one another by layers of a granular bioplasson. The process of inflammation in many instances does not invade the whole of the pulp at the same time. I have specimens where only a portion of the pulp or several independent portions have been invaded by the inflammatory process, while a varying amount of the pulp-tissue is left unchanged. The manner in which the inflammatory corpuscles make their appearance is as follows: Portions of living matter, of either the myxomatous reticulum and its nuclei or of the basis-substance (evidently after its liquefaction), grow into a shining homogeneous lump, from which a nucleated mass of bioplasson will arise by a differentiation of the living matter into a reticulum. The living matter of the nerve-fibers furnishes material for the formation of inflammatory corpuscles, which in lower degrees of this process are traceable in the shape of longitudinal rows of inflammatory corpuscles, with but scanty remnants of nerve-fibers recognizable as such. In higher degrees even this trace of former nerve-bundles is lost. The blood-vessels rapidly disappear. Even in the early stages of pulpitis we have difficulty in tracing out blood-vessels, as most of them are either compressed or made impermeable by a process of solidification and splitting into inflammatory corpuscles. Where blood-vessels are seen unbroken, they appear considerably dilated and engorged with blood-corpuscles. The arteries resist the destruction for the longest period of time. Even in considerably inflamed pulps

FIG. 3.



PULPITIS.—*S*, secondary dentine; *B*, bay-like excavations filled with medullary or inflammatory corpuscles; *V*, transverse section of a blood-vessel; *M*, multinuclear body. Magnified 300 diameters.

we meet with arteries which have retained their essential features. An artery in one of my specimens, cut transversely, shows the concentric layer of smooth muscles split up into small lumps of living matter, and in its inclosed space a large number of inflammatory corpuscles, evidently sprung from proliferation of the endothelial coat.

As the process of pulpitis advances, first the secondary and afterward the primary dentine becomes destroyed to a greater or less extent. The process is essentially the same as the destruction of cementum due to pericementitis. The solid basis-substance of the dentine is at first deprived of its lime-salts, after which the gluey portion is liquefied. This liquefaction invariably takes place in the globular territories of the dentine, and by the coalescence of such territories bay-like excavations are seen penetrating the dentine, at first with faint outlines and afterward sharply defined from the calcified basis-substance. In consequence of this liquefaction the original bioplasson condition of the dentine is re-established. If the inflammatory process is a slow one (chronic), it may happen that from a former territory of dentine, by a process of recalcification, a territory of bone may originate, in the center of which we recognize an oblong, branching bone-corpuscle. This formation, however, is rather exceptional. The rule, on the contrary, is that the bioplasson filling a bay-like excavation becomes supplied with a number of new nuclei, thus representing the stage of a multinuclear bioplasson body. Such a mass splits up into a large number of inflammatory corpuscles, which, in the bay-like excavations as well as in the pulp-tissue proper, establish a condition termed "inflammatory infiltration."

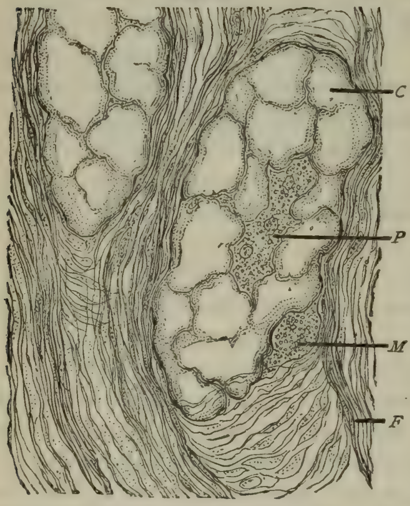
In milder forms of inflammation the pulp-tissue, although considerably changed, still remains a tissue as long as the delicate filaments of living matter interconnecting the single inflammatory corpuscles with one another and with the periphery of the pulp are unbroken. At this stage, should the inflammatory process abate, the tissue may advance into the original condition of a basis-substance. As is known, every variety of connective tissue, once inflamed, becomes a fibrous or cicatricial tissue. It is quite possible, therefore, that the few pulps I have met with exhibiting the structure of fibrous connective tissue and scantily supplied with blood-vessels are the products of a former inflammation. It is also probable that further advance into other tissues found in the pulp, such as dentine and bone, are the results of a slight inflammatory condition which did not extend to the stage of hyperplasia or hypertrophy. In a few specimens, mostly of fibrous structure, I have seen the bundles of medullated nerve-fibers transformed into rows of fat-globules. Evidently here the nutrition of the nerve-fibers has been interfered

with to such an extent as to allow the formation of fat from the nerve-tissue proper. Should the inflammation reach a high degree, the inflammatory corpuscles will become separated from one another —torn apart—and the result is the formation of pus, which, as a matter of course, is no subject for microscopical research, except the discoloration of the dentine of the tooth. Of this, for the present, I have nothing to say. An intense inflammatory process may very soon lead to an engorgement of the afferent vessels and their strangulation by pressure. In this instance death and putrefaction of the inflamed pulp will ensue, which is known clinically as "gangrene." Some reliable observers claim that gases of putrefaction in gangrene may be developed in quantities sufficient to crack the tooth. In my practice I have never encountered such an accident.

Calcification and Waxy Degeneration.

Deposition of lime-salts in the pulp-tissue is very common. It presents itself in the shape of globular, elongated, or irregular formations, having under the microscope a more or less lobulated surface and a high degree of refracting power. The age of the person apparently has nothing to do with the calcification of the pulp. Some very good observers have described it as the result principally of caries or loss of substance of the tooth by mechanical means. I have a great many specimens of pulps prepared from bicuspids and first and third molars of young persons, which had to be extracted on account of irregularity or want of room, and most of them are externally perfectly sound. Some of the wisdom-teeth were removed when only one or two of their cusps had pierced the gum, but with only one exception all of these pulps exhibit greater or less quantities of calcific deposits as well as eburnifications. The same conditions I have observed in pulps derived from the teeth of old persons.

Fig. 4.



Calcification.—Pulp of a first lower molar of a healthy young man 18 years of age, extracted on account of irregularity.

C, calcified masses composed of irregular lumps, probably former medullary corpuscles; *M*, medullary corpuscle unchanged; *P*, central plastid free from infiltration; *F*, capsule of fibrous connective tissue. Magnified 300 diameters.

Pulps containing a larger number of calcified spicula, as a rule, exhibit more fibrous connective tissue than myxomatous. Invariably around the calcified masses a dense layer of fibrous connective tissue has formed, ensheathing the calcified masses. Where these masses have fallen out an empty fibrous sac is left behind, in which there are neither endothelia, so characteristic of blood-vessels, nor oblong nuclei, which we see in the external perineurium of the bundles of medullated nerve-fibers. The presence of this envelope may convey the idea (especially if the calcified masses are elongated and appear like small lobulated sausages) that an obliteration has first occurred in the blood-vessel by a process which in other vascular systems, mainly that of the lungs, is known as "fatty embolism." The application of different reagents, especially osmic acid, has, however, convinced me that neither of these formations is a fat embolism, and I am unable to observe any positive connection between the blood-vessels and the calcified masses. Sometimes it looks as if a capillary blood-vessel were attached to the space containing the calcified mass, or it may occur that a capillary vessel is suddenly dilated like a small aneurism, and in this widened portion we notice pieces of a calcified mass. The idea that the plasma of the blood laden with lime-salts accumulates in the capillaries of the pulp, and, unable to escape behind, deposits its lime-salts, I do not accept.

Much rarer than calcification is a peculiar change of the pulp-tissue which I have observed, both with and without calcifications. It consists of a transformation of the myxomatous tissue into a shining, nearly homogeneous mass, devoid of a distinct demarkation between it and the unchanged tissue of the pulp. In this homogeneous mass, which may greatly vary in extent, we recognize granular, stringy formations, and not infrequently smaller bundles of nerve-fibers not noticeably changed in their structure, traversing the homogeneous fields. In some instances the nerve-fibers within such fields look dark and coarsely granular, as if composed of crumbs. All I can say as to the reagents applied is that the homogeneous mass readily stains with carmine.

Changes of tissue of this character are very common in different organs, especially in the spleen, the liver, and the kidneys. They always indicate a low degree of nutrition, and are said to be generally caused by syphilis. This change bears the name of "amyloid or waxy degeneration." Its nature, however, is yet far from being known.

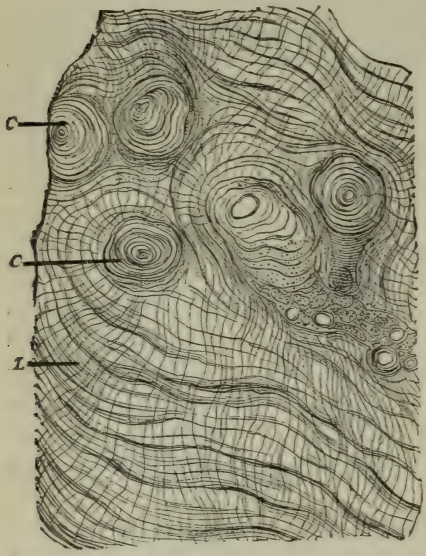
Dentinification, Eburnification, and Ossification.

It was necessary to make a new word for the designation of a process which, although known for many years, has never been

fully understood. I refer to the new formations of dentine in the midst of the pulp-tissue independent of the dentine composing the walls of the pulp-chamber. It is the formation of the so-called "pulp-stones" which by some observers are announced as the result of a process of calcification, but by John Tomes, Ulrich, Hohl, Bruck, Baume, and Witzel, have been described as formations of a variety of secondary dentine. So-called pulp-stones, as is well known, may be found either connected with the dentine proper by means of a peduncule, or loosely imbedded in the connective tissue of the pulps. Most of these formations are composed of dentinal tissue in the form termed secondary dentine. Rarer occurrences are those constructed exclusively of a laminated bone-tissue. Somewhat rarer are combinations of both dentine and bone-tissue. The rarest are new formations of dentine strictly identical with primary dentine.

1. So-called "pulp-stones" of the character of secondary dentine. The most marked characteristic of these specimens is the presence of dentinal canaliculi irregularly scattered throughout the calcified basis-substance. Sometimes the canaliculi assume a tolerably well marked radiation; at others large masses of calcified basis-substance are destitute of canaliculi, which, in scanty bundles, are found toward the periphery of the pulp-stone. All the three varieties of secondary dentine which I have described in the DENTAL COSMOS, Vol. XXI., are found in these formations. Portions of the basis-substance, especially toward the periphery, may exhibit delicate concentric laminations. In the midst of an apparently homogeneous basis-substance small laminated territories may occur, containing a central corpuscle with branching offshoots, somewhat resembling a bone-corpuscle. In sections of one pulp-stone I have found numerous concentrically laminated territories, more or less distinct, and either one or two protoplasmic formations in their centers. The tissue between the

FIG. 5.



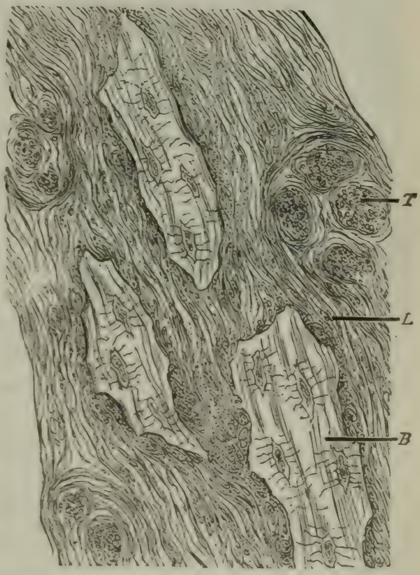
EBURNIFICATION.—Section of a pulp-stone of a lower molar.

L, lamellated secondary dentine, traversed by radiating dentinal canaliculi; *C*, *C*, globular masses, exhibiting a concentric striation. Magnified 300 diameters.

territories was partly granular and composed partly of a tissue like secondary dentine with irregular canaliculi. Here and there medullary spaces were seen traversing the tissue from which evidently the new formation of the territories had started. This variety is the regular osteo-dentine.

2. So-called "pulp-stones" composed of regularly developed laminated bone. I have, as mentioned before, pulps composed almost exclusively of a dense fibrous connective tissue, the bundles of which are interlaced in all directions so as to establish a regular cicatricial connective tissue. Scanty nerve-bundles and blood-vessels traverse the dense connective tissue, which in some places appears to be more or less crowded with medullary or inflammatory corpuscles. In such fibrous pulps I have seen smaller or larger masses of fully developed bone-tissue, composed of more or less regular lamellæ, or of calcified fibrous lamellæ. In these a large number of irregular branching bone-corpuscles are seen, arranged in rows or chains, where the basis-substance shows a more fibrous character. Sometimes the bone-tissue appears in lamellated islands, sharply marked from the surrounding fibrous tissue. No formations of secondary dentine were combined in these cases with the bone-tissue.

Fig. 6.



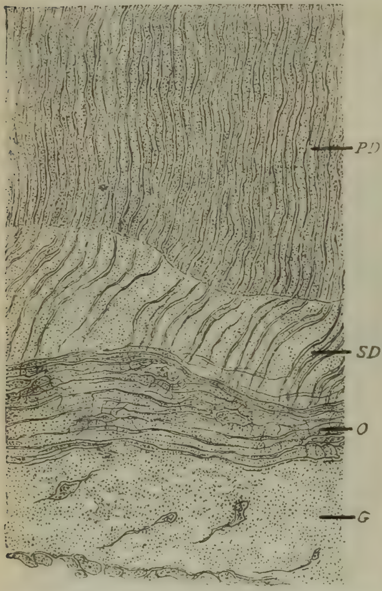
Ossification.—Section of pulp of upper lateral. *L*, longitudinal, *T*, transverse, bundles of cicatricial fibrous connective tissue; *B*, spicula of lamellated bone. Magnified 500 diameters.

3. So-called "pulp-stones" composed of a mixture of regular bone and dentinal tissue. In rare instances I have met with pulp-stones partly composed of secondary dentine and lamellated bone in such a way that irregularly bounded masses of bone contained a few large bone-corpuscles, alternately surrounded by a basis-substance, which contained only irregular, wavy, dentinal canaliculi.

4. So-called "pulp-stones" composed of dentine with the features of primary dentine. I have examined a large number of pulp-stones; one of them, a mass about the size of a pea, was built up of dentine.

The canaliculi of this dentine are perfectly parallel, and between these a finely reticular basis-substance, arranged in the same way as we see in the primary dentine of temporary teeth of children, which teeth are generally poorly supplied with lime-salts. In this specimen, too, the dentinal canaliculi are very wide, the basis-substance between them, on the contrary, narrow. The dentinal fibers are relatively bulky beaded formations with numerous large conical spokes penetrating the peripheral space of the canaliculi. This regular dentine toward the periphery of the pulp-stone is bounded by a slightly fluted contour, a narrow zone which exhibits the structure of canaliculated secondary dentine. This zone blends with a still narrower one, which is composed of an indistinctly lamellated bone-tissue, wherein bone-corpuscles, large in size but few in number, are imbedded. This layer is followed by the bounding layer of the specimen, exhibiting a granular appearance containing a few angular or spindle-shaped protoplasmic bodies and a few dentinal canaliculi.

Fig. 7.



Dentinification.—Section of pulp-stone of upper molar.

PD, primary dentine; *SD*, secondary dentine; *O*, irregularly lamellated bone-tissue; *G*, granular layer toward the pulp-tissue. Magnified 500 diameters.

As to the development of dentine and bone in the midst of pulp-tissue, I have to say only a few words. Carl Wedl thinks that these formations arise from an invasion of the odontoblasts into the midst of the pulp-tissue, he assuming that dentinal canaliculi can only be formed by that layer. My own observations demonstrate that the odontoblasts are nothing but medullary corpuscles arranged in rows. In the present stage of our knowledge we have no reason to assume that the medullary corpuscles of the periphery of the pulp are specifically destined for the formation of dentine. It is just as reasonable to assume that the blood-vessels in the pulp furnish a certain variety of pabulum to the medullary corpuscles termed odontoblasts, under the influence of which nourishing material they are transformed into the tissue of bone.

Should medullary corpuscles, in consequence of a slight irritation

or an augmented afflux of nourishing material, arise in the midst of the pulp, they may just as well produce dentine as bone. The laws which control the new formation of tissue are as yet far from being understood, and it seems to me that very little can be gained by the assumption of a specific function for the medullary corpuscles.

(To be continued.)

THE QUESTION OF UTILITY IN DENTAL EDUCATION.

BY A. H. THOMPSON, D.D.S., TOPEKA, KANSAS.

[Concluded from page 304.]

Let us see, then, what the practical man and the opponent of scientific education has to complain of. To begin with, What is a scientific education, and how can it be defined? We assume it to be a course of instruction in the various branches of human knowledge with which we have to do in our professional duties as dental specialists, to the exclusion of all irrelevant matters. The student must be taught and trained thoroughly in all the implicated branches of zoology, anthropology, medicine, physics, and mechanics, in proportion to the needs of such knowledge, the discipline of the mind, and the requirements of practice. This, we will all agree, is a fair definition of a scientific education. But the practical man exclaims, "It is too much and too little!" He insists that there is too much science and too little practical training. In defense of this, he calls our attention to the indisputable fact that the drift of cotemporary reform movements is toward thorough scientific culture, and that we must understand, also, that a scientific education *per se* is necessarily exclusive of and antagonistic to practical training. Most educationists and writers on education assume that practical instruction is a natural sequel and accompaniment of scientific thoroughness; but this is a fatal fallacy, for in point of fact the essential principles of the two are directly antagonistic. The scientific man, as a specialist, a scholar, an investigator, a searcher after abstract principles, is not the man who applies those principles to the service of mankind, or who utilizes scientific knowledge and discovery. That is the province of the inventor; that is a distinct work, and requires a very different order of mind. Now, if we train students to be scientific and nothing else; if we do not teach them to apply that knowledge,—and such is the real tendency of modern reform,—we shall have a race of scientific but incapable practitioners, such as has been produced abroad by such coercive and exclusive measures. Admitting that the scientific facts have been properly arranged in the student's mind—his knowledge thoroughly systematized—he is, without the

training of invention and skillful application of knowledge, a mere cyclopedia, with a store of information which he does not know how to utilize.

While the agitation of the reform of education has already borne the fruits of causing a movement toward the superseding of the old-fashioned method of cramming, by the later systematizing of instruction, the tendency is, notwithstanding, toward the too exclusively scientific. The colleges are devoting all their energies toward the elaboration of complex and fanciful curricula of study and ideas which will "take" with the advanced thinkers and reformers, and thus place them in the van of progress. The standard is elevated; the methods of teaching are improved and multiplied; eloquent lecturers lead the enthusiastic minds of youth upward and onward into new fields and further heights of science, there to display to their astonished eyes the glories of the newest hypotheses, and bring them into the very presence of the battles of the giants. If the student does not become a scientific man and an investigator, it will not be for lack of opportunity. He may know all the theories of the day, and be "up" in all the advanced learning of the age, but he is not prepared for work, because he has not been taught to apply his knowledge or utilize his science. In view of this, the utilitarian spirit of the age puts us upon the defensive in regard to an exclusively scientific education.

The reformers are determined to make of the coming dentist a scientific man, and they are so far right. They demand that he must know all that can be taught him of all the sciences involved in the dental cult, because that will alone fit him for the intelligent performance of his special duties in the service of his fellow-man, which he must be given to understand is the end and aim of his being as a dentist. This must be conscientiously performed up to his natural capacity. So far, good; but the climax of education so justly demanded by the utilitarian, the helpful and effective preparation for work by the ability to unite science and labor, to wed theory and practice, is up and beyond this. In this matter the demands of utilitarianism are upon us, and we must heed them; but the colleges have heretofore, with ignorance characteristic of this half-educated age, strangely escaped the conception of the proper marriage of science and work. The need of the genius of the inventor, which can appreciate the usefulness of a scientific fact and apply it to the service of mankind, is painfully manifest. The great discovery of Galvani lay fallow for centuries, until a Morse arose to apply it to the needs of humanity. It is *this* faculty which we now need,—the knowledge of the exact relationship of science and art, that we may wed the abstract to the concrete. In this, the objection

of the utilitarian stands good and unanswerable. The colleges are, perhaps, up to the requirements of the age, or are reaching forward to respond to the demands of the advanced thinkers and reformers. Before we condemn our colleges we must be sure that we know what we want to take their place as an educational medium. As yet we do not. We know that we need something at once scientific and practical, but we do not know what we want. In this is our weakness. We are yet defenseless before the charge of inutility. The training of the advanced colleges tends toward the dangerous ground of the too exclusively scientific, to the injury and neglect of the equally important and necessary experimental and practical,—the demonstration of the application of science to work. How this is to be accomplished is now the problem, for present methods are mischievously ineffective, and, indeed, are worse than useless, for the student acquires a slight knowledge of methods before he comprehends their meaning, and too frequently goes forth to practice without ever acquiring such knowledge. That this is our chief weakness, we must concede to the utilitarian.

But he also complains that much that is scientific is not directly useful to the dentist. To this we reply, a scientific system does not include aught that is irrelevant. Each involved science fills an important place in contributing facts necessary to the symmetry of a perfect education. Qualified educators have arranged a curriculum which is as perfect as anything human can be. Their varied experience and learning have contributed to the development of a system which is the best the age can afford. In this system nothing is wasted, nothing is lost. The qualified educator in a special field is the best judge of what branches of knowledge should enter into the curriculum of study for the student of that specialty, and what should be excluded. The experience of many years has demonstrated the wisdom of this discrimination. This duty he has performed and can perform better than the unscientific, uneducated utilitarian, who cannot be accepted as a judge of such matters, for he lacks not only acquired ability to discriminate nicely, but also that natural appreciation of requirements which is indispensable to intelligent and just judgment.

We would urge further upon the utilitarian that, in addition to this, the mere act and effort of study, the necessary mental exercise involved in the labor of acquiring knowledge, is incalculably helpful in developing the latent strength and faculties of the mind, and in thus preparing it for real work. Preparation for physical labor and manual skill involves effort and exercise to the end of developing and training the various parts of the human frame for special labor, and is it unnatural to suppose that the mind, the brain, should

be trained as well for work? Aside from the reasoning from analogy, the value of mental training is demonstrated in active life. Proportionate success and usefulness is the difference between the man who is highly educated and the one who has little or no education. It is not that the educated mind is stored with a profound knowledge of the classics, or mathematics, or science, or history,—as the vulgar suppose,—but it is because the mind is trained and strengthened by the exercise of acquiring such knowledge, and is thereby prepared for more active, intelligent, and successful effort in the struggle of life. It is the training that tells,—not the knowledge of the classics or of algebra. This is a fact which few fully comprehend, and the misapprehension of which is at the base of many popular educational fallacies,—such as the common-school system, for instance.

So we insist that another practical advantage derived from a systematic study of the sciences is the indispensable discipline of mind. This discipline is the indefinite thing which the advanced colleges are now reaching forth to attain by lengthening the term of attendance, and are thus filling a demand. Many do not yet realize or understand the movement, others ignore it; but it is the necessity for this discipline which makes us insist upon a three-years' course that the student's mind may grow and unfold under it like a flower. We insist because the mass of the young men falling into our hands, raw and undeveloped as they emerge from the common schools, must receive that discipline in our professional schools which they failed of in the proper place,—in their preliminary and general education. We must endeavor to unfold the intellect by the systematic study of those sciences which are involved in the dental curriculum. A "good English education," which we hear so much about now-a-days, as a preliminary requirement, is not the only preliminary necessity. A disciplined mind is another and possibly greater necessity, and this we must endeavor to add where it is deficient in the young men of our age, by putting the mental powers in training by the systematic study of the dental sciences. We make this a necessity because it is not possible for us to obtain collegiate men for novitiates in our day, and we must consent to compromise with the half-educated material spawned by the common schools which comes to us. This is a hard saying, a humiliating confession, but it is an undisguisable fact. If we could choose our students from the men graduated from our colleges and universities, we would not need to struggle so fiercely with the problem of dental education. Prepared material would then be ready to our hand, in condition to receive and appreciate a scientific education. But as long as the higher education is at a premium, and is a rarity, other avocations will offer inducements to its possessors with which we cannot compete, and we

must thus be content with what is left. This is a painful admission, but "'tis true, 'tis pity," and we must make the most of it.

Another disagreeable reflection may be made upon the education of our times, and that is the status of what may be called the morality phase of the graduation question. It is noticeable that students attending the colleges are too often willing to receive diplomas in the least possible time of attendance, without regard to their merits in the matter. They seem willing to receive an honor undeserved. Comparatively few of them attend lectures for the benefits to be received, and to be properly prepared for practice. This is a sad comment upon the morals of education in our profession, and it is not, unfortunately, confined to the students alone. Many otherwise reputable practitioners, as well as many who are wholly disreputable, are willing to purchase and receive degrees and honors without deserving or earning them. Of this we have reason to be ashamed. It does not help the matter that this sort of corruption exists in other professions; right is right, and the ethics of right-doing is unaffected by wrong practices. It is humiliating to be obliged to admit that there are men in our ranks, whether students or practitioners, of average intelligence but debased moral perceptions, who are willing to wear undeserved, who can do so unabashed, a something bestowed, as it were, out of charity for their intellectual poverty! It is pitiable to contemplate.

The question arises, What can be done to cure this ulcer in our professional morals? Perhaps we should create a new department of the ethics of dental education. If there are men who conscientiously prefer the certificate of ability to the ability itself, we have need to go deeper for the cause than the mere individuals themselves. The fault is in the system itself, and the cure must be found in the development of an honest taste for scientific knowledge and skill, a love of knowledge for its own sake. The spread of higher attainments will bring this taste and cure this moral disease. In that, too, is an important item of the utility of the higher education in fostering truth and honesty for its own sake.

We conclude, then, that the objections of the utilitarian to the higher scientific education hold good in only one respect, *i.e.*, in the deficiency of practical training and the proper union of science and work. This deficiency under the present system is indefensible, and must be improved. But we must defend it against his further attacks, because scientific education is valuable, as, first, including nothing irrelevant or unnecessary; second, as being required for mental discipline, and, third, as tending to elevate the morals of dental education.

REGULATION OF TEETH MADE EASY BY THE POSITIVE SYSTEM.

BY J. N. FARRAR, M.D., D.D.S., NEW YORK CITY.

(Continued from page 193.)

No. XX.

Correcting Mal-Position of the Roots of Teeth before they are Fully Developed and Calcified.

To question any accepted tradition is generally considered heterodox, but in human progress the heterodoxy of to-day is often the orthodoxy of to-morrow. This will be a sufficient apology for questioning ideas that seem to me to be only stumbling-blocks in the path of improvement. It has been taught that "the lateral movement of roots should never be attempted before their complete development."

The present paper is not so much to prove the possibility of changing the position of roots of teeth as it is to inquire into the influences of artificial appliances upon undeveloped roots, with the view of ascertaining whether there are any conditions of irregularity of teeth that indicate their use in order to the best good of the patient, and more especially in cases where straggling teeth have encroached upon the path of undeveloped ones so far as to interfere with their development and proper eruption.

In the growth of the teeth every student knows that the crowns are of full size and considerably calcified at the time of their eruption through the gum, which occurs before the development of the roots is completed. As the crowns move out of their original location, deep within the jaw, the roots gradually develop, but do not always grow as rapidly as the crowns move. The roots extend from the cervical portion of the crown first in a cartilaginous condition, after which the earlier portions of the formation undergo calcification, which hardens them more and more as time advances; thus it goes on until the roots are perfected. But it should be borne in mind that in childhood the degree of the development of the roots of different teeth in the same mouth at any given time differs, as does also that of the same class of teeth in different mouths. For clearer comprehension of the subject, let us briefly review the successive stages of the anatomical growth of a tooth.

When the calcified portion of the crown of a tooth begins to move from its position within the jaw, it is little else than a shallow cup, with scarce any evidence of a root or anything that would indicate the shape that the tooth is afterwards to assume, but as the crown advances toward the surface of the gum a ring-like formation is

added, which lengthens into tubular form, until at the time it appears through the gum it is about two-thirds the length the root will be when completed. The degree of development of the root at the time the crown appears through the gum depends, of course, upon ever-varying circumstances.

Between the external tissues called the enamel and cementum and the main tissue within called the dentine there is a so-called "granular" stratum. From this line the calcifying process extends in opposite directions outwardly toward the surface of the enamel and cementum and inwardly through the dentine toward the pulp, and oftentimes in old age portions even of this tissue take on a change of somewhat similar nature.

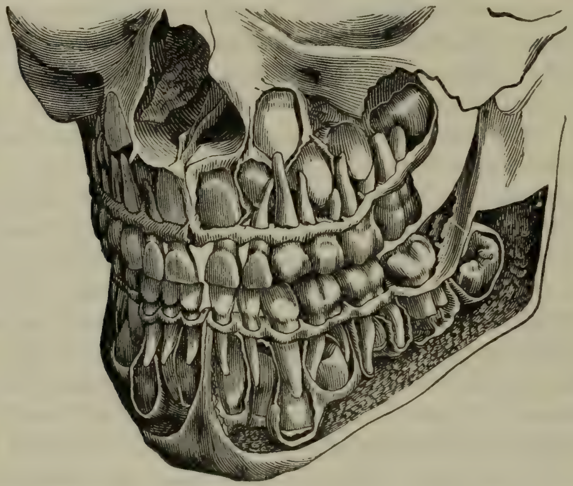
For clearness of comprehension of the conclusion of this paper it should be borne in mind that the end of a partially developed root is in a very soft, pulpy state, while the portions situated a little nearer the crown are in a cartilaginous condition, the body of which is found to be more and more calcified as the cervical portion of the tooth is approached. If it were possible to extract all these portions of a tooth while in this stage of development, and then subject them to maceration to divest the calcified portion of all its soft parts, it would become considerably shorter and would consist of a hollow crown, which externally would be of normal appearance, with more or less of the external portions of the root extending from it, thicker at the cervical portion and becoming thinner as the apical extremity is approached. It is the behavior of that part of the root which is not calcified, together with any possible invisible portion which is as yet undeveloped, when subjected to the influence of mechanical forces, that we are most interested in at this time.

To deny the possibility of causing alteration in the shape of the roots of teeth in the face of so many facts to the contrary would be absurd, for every anatomist, as well as every dentist of experience, knows that such abnormalities occasionally occur in the natural process of dental development. Indeed, it is a wonder, considering the original jumbled arrangement of the second set of teeth before their eruption, that so much order ever evolves out of so much seeming confusion. Yet, notwithstanding a large majority of crowns of teeth are found regular in arches, probably there are but few cases in which some of the roots are not more or less distorted. This fact shows that many regular dental arches probably owe much to a more or less lateral pilgrimage of the crowns along the track of the epithelial cord, thus allowing the crowns to take their proper places in the arch before their roots are fully developed.

The more I study this subject, the more do I see the importance of this curious and wonderful law that causes the crowns to form

and place themselves, leaving the roots for later development along the line of their nutrient supply, which may be straight or crooked, as the case demands,—strong evidence that natural law sometimes seeks esthetic results in parts that are visible at the expense of

Fig. 123.



irregularity of parts that are not. Thus we see, in the outset, that harmony and beauty in the natural formation of the arch often depends upon the crookedness of roots,—a hint that may be of use when considering the matter of regulating teeth by artificial means.

We have seen that distortion of the roots of teeth occurs in nature without artificial interference, and that sometimes seeming abnormality of the roots is so necessary to the esthetic arrangement of the crowns that it must be considered, in truth, normal.

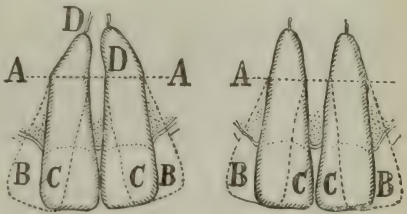
It now remains for us to consider whether straggling teeth which may cause injury to the progress of unerupted teeth may not be safely moved by the timely use of artificial appliances, not only without detriment, but with advantage in every way.

In the first place, let me say that, although crookedness of fully-developed roots sometimes (though rarely) interferes with the proper arrangement of the crowns of teeth in rotating operations in cases that have been neglected until advanced life, it seldom, if ever, occurs in the treatment of teeth in childhood, before the roots are fully formed. Considering that this is the age when operations are generally made, it must be looked upon as evidence akin to proof that the rare cases alluded to would never have occurred had the teeth been corrected in season, and before the apical portions of the roots were fully developed.

If what has been thus far said is true, then it only remains for us to consider the kind and extent of possible interference with roots by the use of artificial appliances, and whether such interference is really detrimental.

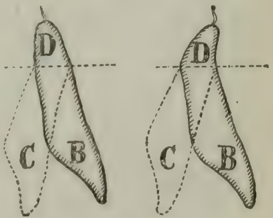
In the operation of simply "righting-up" a crown of a tooth that is only two-thirds developed, a process which does not materially move the uncalcified portion of a root, the long axis of the calcified portion might be thrown out of line of the long axis of the remaining uncalcified portion, provided both were originally in a straight line, and thus cause a curvature; but should the long axis of the different portions of a tooth that is already out of line be operated upon it might straighten it, provided the curvature be in the right direction,—all of which conditions probably occur in many, if not most, teeth that are regulated soon after their eruption in childhood. And yet this point is never considered detrimental in ordinary operations!

Fig. 124. Fig. 125.



Illustrative of these points, Figs. 124 and 125 represent ideally a case (of the second class mentioned in the last paper), illustrating by A, A, the dividing-line between the calcified and the uncalcified parts, with the apical portions nearly in position, while their crowns are not, and by plain lines show the change of position of the calcified portion that is possible by the use of apparatus. Fig. 125 shows how the movement of crowns of teeth before the roots are fully formed may sometimes correct that which would have led to a permanent deformity of the root had it been allowed to remain undisturbed until fully developed and calcified. Figs. 126 and 127 similarly illustrate the possible changes that may take place with instanding lateral incisors which have been forced into proper positions by the aid of an inclined plane. The dotted lines illustrate the shape and position that such teeth would in time assume if left undisturbed, and the plain lines show the shape that they would possibly assume if the crowns were forced forward into the proper position, which demonstrates that, view the question as we may, changes of the shapes of roots are of little or no importance, and that the distortion, by any process, is so slight that, all things con-

Fig. 126. Fig. 127.



sidered, it matters little whether roots are thereby made straight or crooked, so long as they will not interfere with the eruptive process of subsequently developed teeth.

Having considered the effects upon uncalcified roots by the righting-up process, let us now take up the main aspect of our subject, *i. e.*, the effect which the lateral movement of the calcified portions of such teeth may have upon the uncalcified portion, for the purpose of ascertaining if there is any important difference, and if there is really any reason why such lateral operations should not be performed.

Fig. 128.

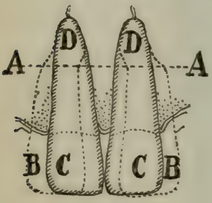
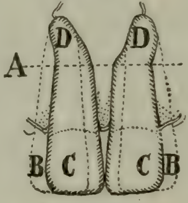


Fig. 129.



Figs. 128 and 129 represent by similarly-dotted and plain lines two different ideal cases of upper central incisors, showing, in the same way as the other figures, the difference between the original shape of the two and the appearance of the possible changes that might be caused in them by the lateral movement of the calcified portions of the roots. The two figures are also intended to show how the same kind of an operation upon different cases may produce quite a difference in the relative positions of the developed and the undeveloped portions.

In Fig. 128 the calcified portions of the teeth are shown to have straggled apart, while the rudimentary portions are nearly in position, showing how such teeth would be made more nearly straight by an operation that would force them into the positions shown by the plain lines. But in the case illustrated by Fig. 129, where the undeveloped apical portions are also abnormally separated, the same sort of an operation would probably cause a somewhat greater deformity, although the position of the crown-portion would be the same.

Although it is true that the position of that portion of the roots which are as yet undeveloped and necessarily compelled to form somewhere along the course of the nutrient vessels which furnish the already developed portion of the teeth, would involve a slight deformity of the teeth,—that is, in the relation of the roots to the crown; still, it is difficult to conceive how such a deformity of the soft portion of a root would affect the progress of a subsequently developed lateral incisor trying to erupt alongside of it, for the reason that the (hard) crowns of such subsequently developed teeth have generally *passed beyond the region of the uncalcified portions of the others.* Even if it were not so, the (hard) crown of the later-developed tooth would have the advantage over the softer uncalcified and undeveloped portions of the root sufficiently to push them aside out of its way.

Interfering and straggling teeth should be moved out of the way of others that are underneath, not only because they may prevent their eruption or cause irregularity, but in order to prevent defective enamel. This condition is sometimes caused in this tissue under such circumstances, and is often beyond remedy.

While I have seen cases where delay has led to mischief, I have not as yet seen any harm arise from proper and timely operations It is well, however, to determine as nearly as possible the best time to commence them, in order to avoid the use of retaining fixtures longer than is necessary. But if there is any doubt on this point, it is better to begin too early than too late.

(To be continued.)

PIVOTING TEETH.

BY M. H. CRYER, M.D., D.D.S., PHILADELPHIA, PA.

(Read before the Odontographic Society of Pennsylvania, February, 1882.)

It is not my purpose to recount the rise and progress of the art of placing natural or artificial tooth-crowns on natural roots. The practice passed its infancy long ago, but within the last few years it has been the subject of great and marked improvements, and the operation is now performed in many cases where formerly it was considered impracticable.

For a long time the operation was confined to sound roots of the six superior oral teeth, but now crowns are engrafted on all roots or even parts of roots that by treatment can be made serviceable. Prepared wooden pivots have been used for years, and, under favorable circumstances, proved useful through a long service; but decomposition of the fluids of the mouth absorbed by the wood renders it offensive and objectionable. As an instance of the permanence of this method of pivoting, I recall a case where a right central incisor on a wooden pivot was worn with comfort for twenty years, although the pivot had to be renewed occasionally. Finally the hole in the natural root became so enlarged by decay, wear, and reaming, that a wooden pivot was no longer practicable. The root was sacrificed by a dentist who, ignorant of other methods of attaching crowns, extracted it and subjected the patient to the discomfort of wearing a plate. The objection to the use of natural crowns, in addition to the expense, is that they absorb the fluids of the mouth, decay, and become offensive. Porcelain crowns that match the natural teeth in shape, size, and shade, can now be had, and are much better than natural ones.

In all cases, whatever mode of crowning be contemplated, the roots should be brought to a healthy condition. The proper treat-

ment belongs to the therapeutics of dentistry, while preparing and placing the crowns in position calls for the skill of the mechanical dentist. Time will not permit me to give a description of many methods that are of great use, among which is that of setting the Richmond crown. These crowns are coming into general use for roots that would otherwise be sacrificed. The attaching of crowns to pivots by means of screws or gold boxes, and the securing of the latter by building around with gold, should be abandoned on account of the pain and injury inflicted by the rubber-dam, the wear of the pulp-canal by the screws or boxes, and the limited period of utility, as demonstrated by actual use.

To confine my attention to some of the practicable methods of the present time which promise much for the future, allow me to mention some of those now by daily use proved to be valuable.

Professor Flagg's mode is to select a suitable plain plate-tooth with straight pins, fit it into position by grinding, and bevel it by cutting away from near the cervical pin to the labio-cervical edge (see Fig. 1). For the pin he uses platinum wire of about No. 14 United States gauge hammered flat at one end. Through this flattened portion holes are punched for the pins in the crown, and the platinum wire is then soldered fast to the tooth. Barb the pin a little, and if it fits with the crown in position it is ready for insertion. The hole in the root, for this and for all the methods about to be described, should, if possible, be a little enlarged just within the opening, to make a dovetail attachment. Professor Flagg prefers it to be bell-muzzled. After drying the canal, place the crown in position and pack a quick-setting amalgam into the root, building down with the same upon the back of the crown. When it has thoroughly set, trim away any surplus amalgam, and polish.

Fig. 1.

Prof. Flagg's Pivot-tooth.
A, slot for amalgam, Dr. Boice's suggestion.

For making more secure attachment of the contour portion of the amalgam Dr. Boice has suggested that, by means of a corundum-disk, a groove should be cut into the porcelain between the platinum pins (see A, Fig. 1), the space thus left between the tooth and flattened portion of wire to be filled with the amalgam which embraces the wire at this point. A somewhat similar method is to select a plate-tooth and prepare it in almost the same manner; adjust the rubber-dam, regardless of the pain it causes; place the crown in position, and build gold into the root, around the pin, and down upon the back of the crown, until the full contour is made. This latter operation is so tedious, painful, and fatiguing to both patient

and operator, and has so frequently failed in a short time, that it cannot be recommended.

The crowns known as the Gates-Bonwill are useful in many cases and easy of adaptation. They can be attached to roots where the hole has become much enlarged, or where the axes of the crown and root are not in a direct line. For the oral teeth the crowns are very similar to those made for use with the old wooden pivot, only that the pivot-holes are continued through the crowns, opening on the lingual or palatal surface. Both ends of the perforation are made slightly larger than the middle,—shaped somewhat like an hour-glass. In the bicuspids and molars the holes pass through the crowns to the grinding-surfaces. Gates and Bonwill recommend the fastening of these crowns to the roots by means of a suitable pin which passes through the crown into the root and is surrounded by a quick-setting hard amalgam for the attachment. One of the objections to this operation is that unless it is *very nicely* jointed there will be a dark line at the free margin of the gum. The shade of the teeth is liable to be darkened by the silver of the alloy uniting with sulphur and forming a black stain,—the sulphuret of silver. It will be well to use a porcelain crown of a lighter shade to offset this discoloration from the amalgam. Where crowns are mounted in this way it is well to fit two, so that in case one should break the other can be doweled on to the pin which remains in the root. For molars it is best to use No. 14 or 15 wire, one piece for each root. This promises to be one of the best means of replacing a molar-crown. Occasionally the holes in these crowns may be too small or, perhaps, not quite in the right place, In such cases they may be enlarged or the direction changed by means of a diamond drill or a drill made of copper covered with corundum-powder and oil. Some dentists have used these crowns by doweling them to roots in various other ways than the one just described. A method found useful by me is, after the crown is fitted, to take a piece of No. 14 platinum wire sharpened and roughened or barbed a little at one end, which should be passed through the crown into the root and cut off at the level of the external opening. If the pin will not pass through the crown, place the wire into the root first; then cut it off, leaving it a little too long rather than too short. Withdraw the wire; slightly flatten the crown-end; secure it in the crown with a little wax at the outer opening; press it into position, and, after carefully fitting, invest the root-end of the pin

FIG. 2.

The crown invested for soldering. At A the plaster is cut away to show the position of the pin; at B is seen the flattened end of the pin on which the gold is to be flowed.

and the porcelain crown in plaster (see Fig. 2), leaving the external opening of the pin-hole free from and above the plaster, into which, after removing the wax, flow plate, coin, or pure gold, to fasten the platinum pin firmly in the porcelain crown. (See D, Fig. 7, or A, Fig. 3.)

Another method is to use a good quality of oxychloride cement instead of the gold, letting it pass pretty well up into the hole in the crown (Figs. 6 and 7). After the cement has set, heat it over the flame of a spirit-lamp, which causes it to harden, without apparent contraction. I have seen many set in this way, and none as yet seem to have been affected by the fluids of the mouth. A number have been under my personal observation, some of them for over eighteen months. In the last two methods mentioned the root-attachment may be similar. The color of the crown may be modified by the cement used to fasten the pin, where a proper shade cannot be obtained. The pulp-cavity should be thoroughly cleaned and wiped out with cotton or amadou, and dried with the hot-air syringe. The cavity should be a little larger just within the root than at the opening (A, Fig. 7); this groove or undercut can be made with an oval bur (92 or 93 S. S. White catalogue). It is best to plug the upper portion of the pulp-canal tightly with gold to prevent the

FIG. 3.

FIG. 4.

FIG. 5.

FIG. 6.

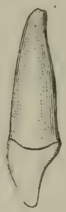


FIG. 7.

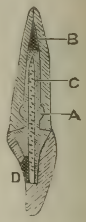


FIG. 3.—Sectional view of the porcelain crown and the pin or dowel. A, attachment of pin to crown by gold head.

FIG. 4.—Sectional view of porcelain crown with pin or dowel attached by oxychloride of zinc.

FIG. 5.—The porcelain crown ready for insertion.

FIG. 6.—Pivot-tooth in position as recommended in article.

FIG. 7.—Sectional view of same. B, gold filling in apex of root-canal; C, pin or dowel; A, gutta-percha filling in retaining-groove; D, gold head to pin or dowel connecting it with porcelain crown.

passage of moisture into the canal (see B, Fig. 7), or the fluids of the mouth or gases through the apical foramen. The parts should be well guarded with napkins and a small piece of amadou held at the margin of the gums to guard against moisture. A good quality of medium-heat gutta-percha should be put into the root, using only sufficient to fill about one-third of the remaining cavity. The pin, slightly coated with gutta-percha and warmed, can be carried up, and the gutta-percha pressed outward against the walls, making the

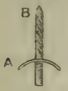
canal gas-tight. The crown can be grasped with a pair of foil-carriers. the porcelain portion warmed until the gutta-percha is quite soft on the pin. and then carried to its place. After the pin has entered about half way into the root. take a piece of box-wood with a notch cut in it, and force the tooth into position, holding it there until cooled. The cooling may be hastened by the use of water from a syringe. or by the application of a piece of lint or cotton saturated with water. The patient should be cautioned that considerable pressure will be necessary. and that some pain may be experienced in forcing the crown into position. Gutta-percha has several advantages over amalgam: the operation can be more quickly accomplished: it is one of the best tooth-preservatives; it is not liable to discolor or make a dark line at the margin of the gum. The surplus gutta-percha will fill up any imperfections at the joint, and if there be an overplus it will protrude around the tooth, and should be subsequently trimmed off. A crotch-shaped steel instrument designed by Professor Essig is very handy for holding the tooth while being heated. and keeping it warm while being carried to its place and forced into position. In a few cases, more particularly in bicuspids. amalgam may be of service to secure the pin in the root. Sometimes it is well to tie the tooth in position until the cement has set and all is thoroughly firm. Some operators use oxychloride of zinc in the same manner.

If the roots are very narrow, as those of the lower centrals, the Gates-Bonwill crowns cannot be made to fit at the neck. For such it is generally best to use plain plate-teeth with straight pins. Several ways of mounting these plate-crowns have been described,—notably with gold pins and stays, as well as the Flagg mode already mentioned.

The method by which I mount these crowns being the *base* of many different operations, I shall describe in detail. The root being prepared. select a straight-pin plate-tooth suitable for the vacancy, as a rule using cuspids for bicuspid roots; grind and fit the tooth into position; with platinum foil, about No. 40, cover the back and about two-thirds of that part of the crown which rests against the root: force the pins through the platinum and solder it to them with pure gold. flowing it over the surface of the foil to form a firm and solid support for the porcelain. Next, a piece of platinum wire of a diameter suitable for the case (No. 14 being generally used) should be fitted into the cavity in the root by flattening, tapering. and barbing. Burnish a piece of thin platinum plate over the end of the root. trim it down to the proper size. and make a hole in it opposite that in the root; pass the wire through. and if the hole has been made a little smaller than the pin. it and the foil can be withdrawn

together and soldered. It will then be a small curved disk with a wire through the center (see Figs. 8 and 9). Replace, and burnish down the platinum against the root. If the projecting crown-end of the wire on the cap prevents proper adaptation of the porcelain tooth, it is best to cut a groove into the back and gingival portion of the tooth for the reception of the wire. Solder a small piece of wire to the cap for convenience in handling. If the crown-end of the pin or dowel does not interfere, cut it off at about the middle of the tooth. The crown with its platinum back should be accurately fitted to the root while the pin and cap are in position, to which latter it may be attached with wax. Remove from the mouth; invest, and solder with pure gold. If the wire handle suggested has been attached, it had better be snipped off before investing or soldering. Put on enough pure gold to flow over the part against the cap and to form the proper contour. After finishing and polishing, the appliance may be permanently adjusted as previously described for the Gates-Bonwill crowns.

FIG. 8. FIG. 9.



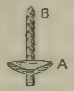


FIG. 8.—Dowel or pin in platinum plate. Front view.
FIG. 9.—Ditto, approximal view.

In the mouth of a student at the Philadelphia Dental College, where the first right superior bicuspid was missing, and there remained a portion of the root of the second bicuspid not strong enough to sustain a crown, and likewise irregular as to position in the arch (see Fig. 10), the following operation was performed: There was a cavity on the disto-palatine surface of the cuspid and a mesial and crown cavity in the first molar. The above-mentioned root was treated and prepared as for filling. An impression of the parts was taken and casts made showing the articulation with the lower teeth. A piece of slightly-flattened platinum wire was fitted into the root for a dowel. A small portion of the cast was trimmed off, so as to cause the neck of the artificial crown to bed into the gum. A piece of thin platinum was burnished over the root and the vacant space corresponding to the original position of the first and second bicuspids, and a hole made through the platinum to accommodate the pin

FIG. 10.

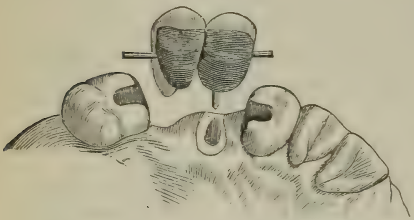
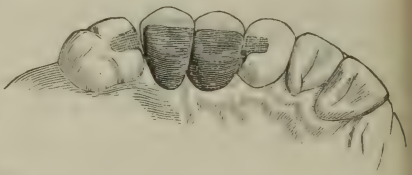
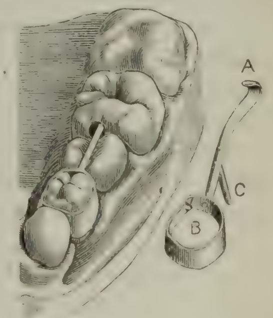


FIG. 11.



which was to be inserted into the root. The pin was now passed through the plate into the root, and treated as previously described in crowning with a plate-tooth. Two cuspids were selected, shaped, and backed with platinum; a piece of No. 18 platinum wire reaching from the cavity in the cuspid to the cavity in the molar, and passing close to and back of the artificial crowns, was attached to the teeth and plate with wax. After trial in the mouth, the appliance was invested and soldered with pure gold over the pins, stays, and transverse wire (see Fig. 10). In such a case, before inserting the ends of the horizontal wire into the natural teeth, it is best to fill the cervical portions of the cavities with gold, after which adjust the dowel in the gutta-percha in the root, as before described, and complete the operation by finishing the fillings in the natural crowns (see Fig. 11). The fillings can be temporarily made of oxychloride of zinc or gutta-percha, especially if they are large, and the patient may be allowed to wear the porcelain teeth for a few days, when, if desirable, the oxychloride of zinc or gutta-percha can be removed and the cavities permanently stopped with gold.

Fig. 12.



Natural inferior second bicuspid held in position by platinum anchored in adjoining teeth. A, hooked end of bar for molar; B, clasp or ring for first bicuspid; C, dowel or pin for root of second bicuspid.

N.B.—The cut should show recession of gum at second bicuspid.

Another case from my own practice is an example of a method by which living teeth, which have become loose through recession of the gums, may be retained in position so as to render good service. Mrs. M., from a distant city, called to make an appointment for the extraction of a number of teeth. After examining the mouth, I concluded not to extract, though the first inferior left bicuspid was so loose as to lean against the lip, an actual annoyance and quite useless for mastication. There was a cavity on its distal surface, but the pulp was vital. The second bicuspid was devitalized, and the first molar had a badly-exposed and much inflamed pulp. I did not wish to lose the first bicuspid, on account of the space it would leave and because the gum and process would recede, thus inviting trouble in the useful adjoining teeth. The first step was to devitalize the pulp of the molar and treat the second bicuspid, putting them both in condition for filling. The excavation of the first bicuspid was attended with unusual pain, so much so as to baffle the attempt to shape the cavity properly to hold an amalgam filling. Fearing that devitalization of the pulp would add to the trouble, as the gum had

already receded much. I made an appliance for holding both the filling and tooth firmly in place. A band of No. 28 platinum plate was made to fit around the crown of the first bicuspid (see B, Fig. 12), to which was soldered a piece of No. 14 platinum wire, flattened and curved to form a hook at one end (see A, Fig. 12), which was adapted to the cavities in the molar, the other end extending to the cavity in the first bicuspid through a slot in the second bicuspid. To this was soldered a piece of wire forming a T (C, Fig. 12), which, when all was in position, would extend well down into the root of the second bicuspid. The ring or band was perforated by a hole admitting the end of the wire, and this junction secured by solder. Thus I obtained an immovable anchorage with the curved end of the wire in the molar, the T-pin in the second bicuspid, and a band around the first bicuspid to hold in place both the filling and the tooth.

After this stay was completed the rubber-dam was adjusted, the cavities dried, and the appliance placed in position. The molar and second bicuspid cavities were filled with oxychloride of zinc, and the cavity of the first bicuspid with amalgam. Afterward enough oxychloride was removed to make spaces for amalgam fillings, which were inserted to serve as a shield to the former. The rubber-dam was kept in place for two hours. Three days later the fillings were finished. This operation was practical and satisfactory, even the first bicuspid being immovable and serviceable for mastication, and it so remains to this day, six months having elapsed since the operation.

DENTAL CARIES.

BY G. P. RISHEL, D.D.S., HORNELLSVILLE, N. Y.

THEORIES in regard to dental caries have been widely discussed in dental societies and journals for many years, but not until the remarkable influence of the resistive force—vitality—was understood, was there anything like a satisfactory solution of the problem. Recognizing that the mouth is a chemical laboratory, ever furnishing some active agent of destruction, we understand caries to be the result of chemical action, but modified by the resistance of the vital forces. Therefore, while accepting as partially true various theories in regard to the injurious effects of confectionery, acid fruits, medicines, etc., we must take into the account that modifying force which should be capable of resisting the encroachment of disease. Sugar, a staple article of diet, entering largely into the composition of jellies, preserves, cakes, confectionery, etc., has been considered a potent cause of dental caries. So, too, the free use of acid fruits is charged with frequently producing exceeding sensitiveness of the teeth with

marked tendency to decay; but, as these fruits were intended for our enjoyment and are necessary to our health, the teeth should not be injured by their use. Many people ascribe the beginning of decay to the use of medicine, and it is a fact that too little care is exercised by many physicians in the administration of certain remedies; but it is quite evident that effects ascribed to medicine have frequently been due to that lowered vitality which made the use of medicine a necessity. Thus, instead of being the cause of decay, it may have prevented the entire destruction of the teeth. The local effects of acid medicines may be averted by the employment of an antacid mouth-wash, such as a few drops of ammonia or a few grains of bicarbonate of soda in water. The teeth should under normal conditions be capable of resisting the action of the oral fluids at all times. When this is not the case the explanation is to be sought either in structural defects or systemic conditions.

Much has been said and written of the deprivation to bone- and tooth-structure by the use of bolted flour, and the importance of this suggestion cannot be too strongly urged, for we have abundant data to prove that a change of diet may result in a radical change of tooth-structure. The use of refined flour will account, however, for but a small percentage of the destruction going on in the mouths of our patients, for it can be easily demonstrated that there is an abundant supply of tooth-material upon our tables, which, if assimilated, would be more than sufficient for all demands.

Mal-nutrition, therefore, we consider to be the principal cause of defective tooth-structure. Depressing systemic influences resulting from nervous irritability, and produced by high living, over-stimulation, and the rush for wealth, place, and power, are destroying not only the teeth, but the lives of the present generation. Even the children are not exempt, and from the time they are large enough to "show off" to the competitive examinations of school-days and the cramming processes of college life everything is on the high-pressure principle.

With a shattered nervous system the young man of twenty-one rushes into business, politics, or a professional life, ill prepared to meet the drain upon the vital forces, but still spurred on by ambition or a love of gain.

Is it any wonder that the trifacial,—the nutrient nerve of the teeth,—which is peculiarly susceptible to systemic influences, should imperfectly perform its functions? Patients of the nervous or of the lymphatic temperament suffer first and most, owing to the quick response to every influence of the one and the slow but unresisting qualities of the other. Surely, the difference between the strong, hard teeth of the bilious, and the soft, bluish-white teeth of the nervous tem-

perament cannot be due to the food derived from the same table, but rather to a difference in the power of assimilation, dependent upon nervous influences. In this connection it may be well to refer to the usual classification of caries—black, yellow, and white—and to the somewhat arbitrary assignment as a cause of each variety,—the effect of sulphuric, hydrochloric, and nitric acids respectively.

If this theory is true, we should expect to find black decay as the result of the action of sulphuric acid upon such tooth-structure as contained the largest percentage of organic material, but, on the contrary, it is universally found in teeth above medium in structure. The writer is inclined to accept the views of Magitot, that "caries is one," and that the different varieties of color are due to the resistive force, which in the strong basal temperaments, as the bilious and sanguine, is capable of almost if not quite arresting decay.

Many observers have noted the difficulty of successfully treating the teeth of patients who are for the time under the depressing influence of severe mental labor or excitement, and the magical effect produced by a return to normal conditions. This may account for some of the difficulties of city practice as compared with that of the country, and may also in a measure explain the cause of great differences of opinion in regard to remedies and methods.

Admitting the deleterious effects of chemical agents to which the teeth are constantly exposed, and giving due weight to the direct and indirect influences of food, climate, medicine, etc., I contend that caries, although not caused by, is largely due to loss of vital force resulting from systemic depression, and therefore concomitant with high civilization.

THE AMALGAM QUESTION.

BY J. FOSTER FLAGG, D.D.S.

(Continued from page 318.)

But, peculiar as are the thoughts which are engendered by perusal of Dr. Talbot's paper, those which are suggested by a conjoined study of it and the editorial upon it by Professor Watt are, naturally, *doubly* so.

The very first proposition of this powerful, industrious, scientific editorial suggests thoughts which are at least *twice* as peculiar as any suggested by the perusal of Dr. Talbot's paper alone. The editorial commences, "Though we find little or nothing that is new in Dr. Talbot's article on this subject, we still consider it timely and appropriate." Now, *why* is it "timely and appropriate?" Is it because articles which do contain *some little that is new* are generally regarded as untimely and inappropriate to dental literature? Or,

is it that the propositions, though old and hackneyed, are worthy, from their weight and importance, of being always regarded as "timely and appropriate?"

This can hardly be so, for Professor Watt, after stating, in defiance of authority, that "the vapor of mercury" (without any reference as to quantity) "is poisonous beyond dispute," also states, in the next paragraph, that, "after all, it is not probable that the vaporization of the mercury of amalgam fillings in the teeth is the only or even the chief source of poisoning."

If this is so, why should a paper the whole power of which is expended to prove that this "vaporization" is the "more direct and simple cause" of *all the trouble* (?) be regarded as in any way "timely and appropriate?"

Again, Professor Watt says that the vaporization of mercury at common temperatures is "so well known by men of science that it seems like a waste of time to prove it, as does Dr. Talbot, yet his experiments are instructive and profitable."

How are they "instructive," if all that they prove was well known before? And how are they "profitable," if they tend to give chief prominence to a cause which is "probably" *not* the chief cause?

Professor Watt says the experiments of Dr. Talbot are "instructive and profitable, for only a few years ago prominent and active members of our profession were claiming that mercury vaporizes only at 662° and upward, that being its boiling-point." Now, this seems to prove inaccuracy and ignorance among "prominent and active members" *at that time*, rather than the possibility of anything instructive or profitable being derived from Dr. Talbot's paper *at the present time*, for it would be markedly discreditable if any of the "prominent and active" were to advance such doctrines at this late date. For these reasons I cannot see that Dr. Talbot's paper can properly be regarded as either "timely" or "appropriate," and I most certainly cannot find that it is possessed of any points which can be regarded as, in the least degree, "instructive" or "profitable." The next participants in Professor Watt's parade are a series of horribly disgusting swollen tongues and glands, universal aching of bones, suffering from *tremor mercurialis*, years of agony, and one broken-down, prematurely-old giant. These are found in company with a female case of *paralysis agitans*, aged eighteen years, from which, through the intervention of some gunsmith-shop excavators, no less than seventeen amalgam fillings were removed.

The broken-down giant's case was a very sad one, for, although he had a healthy wife, his offspring are "puny, neuralgic, total failures," showing how very much more powerful for evil to posterity

are "nine or ten" amalgam fillings than is one healthy woman powerful for good; and yet, the *paralysis agitans* result must be viewed as one of the most favorable among the direful possibilities of amalgam, for, we are informed, in her mouth was "found a mass of blackness," while we are told that where this "blackness" exists "bad results are less likely to follow." On the other hand, it is stated, editorially, that "the worst cases of poisoning we have witnessed are those in which the amalgams retain their bright color;" so it may be possible that the dark cloud of the broken-down giant's case had *this* "silver lining."

It is nothing less than amusing to follow the *reasoning* (?) by which chemically fearful results are imaginatively produced by amalgam fillings. In some mouths it is said that "the mercury is sulphidized," and in such cases "bad results are less likely to follow." In other mouths "the chloride (corrosive sublimate) is more likely to be formed when amalgam fillings are inserted;" and then we are gravely and innocently informed that "it requires but a small amalgam filling to contain twenty grains of mercury, which, if chloridized, will yield twenty-three grains of corrosive sublimate."

Now I ask, seriously, is there a more absurd proposition than this on record for the thoughtful consideration of the members of the dental profession? I ask that it shall be remembered that this statement is made by one who has long been regarded as *a teacher*, who occupies an editorial chair, and who is, *professedly*, a dental chemist.

"If chloridized!"—I should say *if* chloridized! But suppose that it *is* chloridized, what becomes of the amalgam filling? And suppose that the amalgam filling remains, practically, as it is introduced, and the mercury continues *as mercury*, and only "vaporizes," while, "after all, it is not probable that the vaporization of the mercury of amalgam fillings in the teeth is the only or even the chief source of poisoning," what then? It seems to me that it becomes a matter of little moment, so far as amalgam fillings are concerned, whether twenty grains of mercury would make twenty-three grains or *two hundred and twenty-three* grains of corrosive sublimate, so long as the corrosive sublimate is not made. "*If* chloridized," indeed!

And what does Dr. Talbot say of this loss of mercury even by evaporation? He says that he made amalgam fillings and weighed them, and after three months he weighed them again, "finding in some no change at all, and in others an increase of weight;" he then continues, "This is accounted for by the fact that oxidation and accumulation of moisture on the amalgam equalled in some and exceeded in others the loss of weight by evaporation." The *explanation* may be or may not be entirely satisfactory, but the *fact* remains, and in relation to that I would say that, so far as those who

have had the most extensive experience in amalgam-work are able to observe, the condition of amalgam fillings *in the direction of change* in which Dr. Talbot's experiments of weighing would be of any value would remain practically the same at the end of three months, three years, or thirty years, for the condition, *relative* quantity and effect of the mercury in an amalgam filling are regarded as having been proved to be *always the same.* It is from this fact that different proportions of mercury and alloy are combined for the specific purpose of making a softer or a harder filling of amalgam, and the *desired* softness or hardness is a condition which is found to be equally in existence, whether the filling is examined a few months or *many years* after its insertion.

The only noticeable change which ever occurs is actual loss of *amalgam* from attrition, and even this result is remarkably trivial in comparison with what might be expected; and this, too, in fillings composed of an unduly large proportion of mercury, and, in consequence, unnecessarily soft.

In this loss of amalgam both mercury and alloy metals are naturally lost in the proportions of amalgamation, and it cannot, with any reason, be supposed that vaporization or chloridizing have any especial connection with the loss of the mercury.

We now reach a portion of this remarkable editorial at which it becomes a serious question as to how it shall be regarded; I refer to the *naive* narration of *advanced infanticide*, or child-murder, contained in the following brief but striking paragraph:

"Some persons are much more readily poisoned by mercury than others. We have seen severe ptyalism caused by a single three-grain pill of blue mass, and we killed a little girl of twelve years by the administration of six grains of calomel, even though followed by an infusion of senna so as to induce early and prompt purgation."

As with Dr. Talbot and his cockroaches and guinea-pigs, so it is with Professor Watt and his blue mass and calomel, for from this dire mishap in his *practice of medicine* he deduces the inexplicable, irrelevant, and illogical conclusion that, *ergo!* amalgam is not a good material with which to fill teeth! Truly, this line of argument could only be equalled by assuming that the *pilula ferri carbonatis* must be an exceedingly dangerous medicament *because* a man would probably die if struck fairly in the abdomen by the *iron* ball shot from a cannon!

It is only another illustration of the usual appearance of things presented to those eyes which for "a quarter of a century" have been kept persistently at the "big end."

Professor Watt does "not hope to see the use of amalgam fillings abandoned." I regard that as very fortunate, for it certainly would

be a "forlorn hope," indeed, if he did hope it; but, after another slur at the "feeble men," "lazy men," and "poor quacks," following which charitable epithets is, very appropriately, a quotation from Holy Scripture, he concludes the paragraph thus: "But just in proportion as the profession makes attainments in chemistry and pathology will be the decline in the use of amalgams."

What shall I say to this? Can it be possible that dental chemistry and dental pathology have so ignominiously retrograded that in fifty years the consumption of amalgam has increased several thousandfold, "*until now tons are consumed yearly in filling teeth?*"

If this be so it must be regarded as fully time that effort in these two important directions shall be radically changed in its character, or else, for a season at least, be stopped altogether. If the position of Professor Watt be correct, the result is eminently discouraging, and work upon dental chemistry and dental pathology cannot be too quickly abandoned.

But is this so? Is it true that dental chemistry has done naught else but retrograde? Is it true that we know far, far less of dental pathology now than we did fifty years ago? And if these positions are not true, the *reverse*, absolutely *exactly the reverse* of Professor Watt's position is the only tenable ground.

Dental chemistry and dental pathology have both kept pace with the almost unparalleled progress of both operative and mechanical dentistry. They are in no wise in the rear, and *just in proportion as the profession has made attainments in chemistry and pathology has been the increase in the use of amalgam!*

Next in order in the editorial we find that the author has *never* "found occasion to use" and has *never* "used amalgam fillings in practice." Truly, he is the one who should certainly tell us *all* about them.

The time has gone by when such enunciations as the editor here makes have the desired effect of placing him *a little higher* than the other brethren. The thoughts of those who read are *not* as they would have been in days of yore, but *now* they pass, in mental review, the hundreds of teeth which *must* have been lost that could *easily* have been saved: the hours of infliction that *must* have been given which could *easily* have been spared; the thousands of dollars that *must* have been taken which could *easily* have been left: the scores of cases which *must* have been failures that could *easily* have been successes; and they bless the progress which has been made in dental chemistry and dental pathology, and continue giving *satisfaction*—*comfort* and SATISFACTION—to the *timid, semi-edentulous* sufferers who come to them for relief, by doing their share in using a part of the *tons of amalgam which are now consumed yearly in the filling and saving of teeth!*

A fitting "snapper"—because it will not crack!—to this editorial lash is the finally-offered *proof* (?) as to the absence of *close thinking* on the subject by those who discuss amalgam. The concluding paragraph is worthy of quotation as an evidence of what is regarded as "close thought" by an *authoritative* opponent of amalgam:

"This late discussion of amalgam" (referring to that of the Illinois State Society, May, 1881) "shows how little close thought exists on the subject. They talk of the way Dr. Townsend made his amalgam, when they ought to remember that Dr. Townsend did not make it, and always so stated, telling, all the while, that he got the formula and the amalgam from Dr. Wm. Hunter, of Cincinnati."

In my work on "Plastics and Plastic Filling"—adopted as one of the text-books of the Philadelphia Dental College, without my request and without my knowledge—it is stated, on page 30, that "Professor Elisha Townsend, one of the best gold-workers of his day, gave dentistry *his sanction* to the first formula for the making of an alloy for amalgam that ever had the least pretension to '*respectability*.'" On page 35 it is written, "It was not suspected that the 'shrinkage' of the so-called Townsend's amalgam exceeded, enormously, that of the silver-coin amalgam." On page 37, "but it was also due, in part, to my gradual change of formula from that of the so-called 'Townsend's.'" On page 84 it is said, "It is now about twenty-five or thirty years since the mode of making which has been referred to and described as the 'mortar' and 'washing' method was brought to the general notice of the profession by Professor Townsend. It is not claimed that the ideas originated with him, but, on the contrary, it is admitted that the formula for alloy and the process of 'washing' were both given Professor Townsend by Dr. Hunter, of Cincinnati."

These numerous extracts are given to show, conclusively, what a tremendous amount of intensely "*close thinking*" must have been given to this momentous matter,—and yet, this was all bestowed without the knowledge that anything was being done except the making of a plain statement of *facts*.

Whatever may be the *laziness*, the *imbecility*, or the *quackery* of the advocates of amalgam, they are, naturally, and without conscious effort, *very powerful on facts*.

But what an idea of *close thinking* is given by the editorial paragraph last quoted! If it requires "close thought" to "remember" that Professor Townsend obtained his formula for amalgam alloy from Dr. Wm. Hunter, of Cincinnati, what kind of thought must have been required to work out the *possible change of twenty grains of mercury from an amalgam filling into twenty-three grains of corrosive sublimate, to be gradually introduced into the system of a patient?*

Such brain-racking effort would surely demoralize even a "giant."

And now, if, "after all, it is not probable that the vaporization of the mercury of amalgam fillings in the teeth is the only or even the chief source of poisoning" (Watt); and if, in their search for a quality in the composition of amalgam capable of producing salivation and all other symptoms of poisoning, "many able practitioners of dentistry have experimented with all the different acids with no satisfactory results" (Talbot); and if the statement "that the vapor of mercury is poisonous is beyond dispute" (Watt), is so far antagonized by authority that in one case quoted it salivates *nearly all* of a crew, and in another case quoted it proved a *safeguard against contagion* from yellow fever to *all* who had been subjected to it, keeping them "perfectly well, although surrounded by sickness and death" (La Roche, vol. ii., p. 762); and if, in the experience of a tremendously overwhelming majority of those who have extensively used amalgam for ten, twenty, or thirty years, the reputed cases of ptyalism, dyspepsia, paralysis, and death from its mercurial composition are literally "number-*less*,"—is it not about time that the labor of dental investigators should be no longer "wasted" (Watt) in the endeavor to find out *how* these *imaginary* results are occasioned; that the pages of dental journals should be no longer burdened by such contributions and editorials as those found on this subject in the January number of the *Ohio State Journal of Dental Science;* and that the futile attempts to clog that inevitable increase in the use of amalgam, which has been so persistently and so signally demonstrated to be one of the *natural results* of the struggle for the saving of the frail, soft teeth, should be no longer essayed?

(To be continued.)

PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

Regular meeting, February, 1882, at Dr. Dwinelle's.

The President, Dr. Perry, in the chair.

Dr. Lord. I think, Mr. President, that it will be very proper for us at this time to take some notice of the death of Dr. Jehiel Parmly.

I may say that it was my good fortune to be on intimate and friendly relations with him for some thirty-five years; and I am sure that all who ever enjoyed his friendship found him to be very warm-hearted and generous.

He was unquestionably a dentist of rare skill and ability in his specialty; indeed, it may be said of him that he was a good deal of

a mechanical genius, and had familiarized himself with many departments of mechanics.

I think he commenced practice about the year 1834, and he was one of the first, if not the very first, to make a specialty of artificial or mechanical dentistry, so called. He gave a high tone and character to this department of dental art, and probably to a greater degree than any other dentist during the early years of his practice, and he was one of the first to secure proper compensation for such services. He probably had more and better appliances for doing the work than any other dentist in this country, particularly during his earlier years; and most of these he devised and made himself, as he was quite competent to make such tools and fixtures as were required in his branch of dentistry.

It may also be said of Dr. Parmly that he was one of the very few dentists of his early day who were ever ready to show all that they had and to tell all that they knew that would be of use or interest to a brother dentist who was trying to do well.

Like many of the dentists of the olden time, Dr. Parmly had some strong prejudices and dislikes to new things that were regarded by some as improvements, but his high character and the respectability and usefulness which he gave to the profession in its early days must command our respect and admiration, and also that of the generations to come.

Dr. Abbott. I have to-day been at the office where Dr. Jehiel Parmly had been for a number of years with his cousin, Dr. Ehrick Parmly, No. 19 West 38th Street.

Looking over the instruments and appliances for doing artificial work, a great many manufactured by himself, I was struck with wonder and admiration. He has the handsomest and, I may say, the best set of appliances I have ever seen together. Everything is in the room he used for a reception-room; it was a reception-room and laboratory in one, everything inclosed in such a manner that no one would suspect that the room was used as a laboratory at all. It would seem that he hardly had use for any new inventions of others, he had so many of his own. It is worth a young man's time to go and look at the things he had and used so many years, now for sale.

Dr. Dwinelle. I have known Dr. Jehiel Parmly almost as long as I have been in practice, and I considered him one of the best men we ever had with us. His name has added honor to our profession. His department of mechanical dentistry he dignified, almost glorified. He was particularly ingenious, and had the happy faculty of concealing anything that would be ordinarily considered distasteful in most persons' eyes, and of concealing the profession in its objec-

tionable points from his patients' view, so that, as has been said, his very reception-room was his laboratory, and he made it charming and attractive. I think in losing him we have lost one of our best members. He has passed out in the order of nature, and I hope and believe that his memory will be kept green with us all. He is worthy of all commendation and emulation. There never was a better model for us to strive to equal and to pattern after, and I hope this opportunity will be improved to put his name upon our records, so that it shall not soon pass away.

Dr. Rich. I could not upon any condition allow an opportunity to pass, where the name of Jehiel Parmly was mentioned, without paying that tribute to a great man which I think we ought to give, particularly when he passes away from us. Dr. Parmly was one of the best mechanics I ever knew; not merely in the department of practice, but he had been thoroughly drilled as a mechanic. He was an armorer or gunmaker, and learned that profession thoroughly. He was one of the pioneers among those who insisted upon having all the information connected with our practice thrown open to the whole profession, and he deserves to be specially mentioned for his liberality toward his fellow-dentists. In the days when you could not enter the office of a dentist without paying him a heavy fee for showing you his laboratory, Dr. Parmly's was open to everybody who came along; not for a cursory view of it, but to every point of information you wanted to obtain and every appliance that it was possible you might want.

He kept back nothing. An instance of this occurs to me at this moment. A very able man, who had profited largely by that sort of liberality on the part of Jehiel Parmly, called upon him one day,—as he had very often called before,—and in the course of conversation said, "A man came into my office the other day, and I showed him how I did things." And Jehiel said, "You did well; I am glad to hear that; I suppose he was pleased." "I made him pay for it pretty roundly," said the man. Jehiel turned upon him as if he was a thief. "Is that the way *you* have been treated in *this* office, sir? Have *you* been made to *pay* when *you* came to get information, and when you had no knowledge at all, sir? Is that the way you have been served in *this* office, sir? Walk out of it, and never let me see your face inside of the door I occupy!" The man slunk away and tried to apologize. "I want nothing to do with you; walk out of here." The sterling character of Dr. Parmly was shown in this movement to open the doors of knowledge to all, and to abolish the system of petty fees for the most trivial information which had disgraced the profession; and no man contributed more to this result than did he.

He was a great man in every sense of the word. He was a man upon whose principle and word you could rely; and if you went to ask Dr. Parmly what was the best thing to do under any circumstances, you would be sure to receive an opinion that would be that of a truly honest, conscientious gentleman. I could talk all night about his virtues. He was one of my warmest and earliest friends, and we worked together when the profession was merging from the darkness that surrounded it. There never was a more hearty man with time and money in every particular.

Dr. Kingsley. Mr. President,—I cannot let this opportunity pass without saying a word. Thirty-two years ago next month I was introduced to Dr. Jehiel Parmly, the first dentist I ever knew in New York City. He was the first dentist who ever sent me a patient. I was a mere boy, and I looked upon Dr. Parmly as an old man. It is surprising as I reflect upon it now. Dr. Jehiel Parmly was ten years younger than I am now, and yet I thought him an old man and revered him as such. The kindness he always showed me and the warm reception he always gave me created in my mind a strong respect and admiration that have never left me one moment from that day to this. If I have ever achieved any success; if I am entitled to any credit for anything I have done; if I have any professional reputation, I believe it is due more to the example of Dr. Jehiel Parmly than to that of any other man. In all my earlier years of practice it was a constant thought of mine that if I could ever attain to the reputation of Dr. Jehiel Parmly, or to his skill or capability in any sense, it would be the acme of my ambition. I have held him up to others as an example, particularly when I have been to some dental laboratories and found places that were no more fit for dental work than a blacksmith-shop.

Dr. Parmly's laboratory was as clean and neat as any parlor, and the contrast between it and the dirty places called by the name of dental laboratories made them disgraceful. I was surprised beyond measure to see the notice of his death in the paper, which I did not see until after his funeral had occurred. My reflections upon it were rather sad as I went back to those days when I used to say, "When Dr. Jehiel Parmly passes away, how the dental profession will miss him, and how we shall all feel;" and yet the man went, and, so far as I know, there was not a dentist at his funeral!

Dr. Rich. In regard to that, one word of explanation. For a long time before he died he was not in a fit condition to see anybody. His family were obliged to refuse the visits of his most intimate friends. He lingered with disease of the throat, he could hold no conversation, and it was very painful to try to talk to him. When he did pass away, he had been so long entirely isolated from all his

friends, by the state of his mind as well as his physical condition, that, I suppose, his family did not think it worth while to make his death public.

Dr. Dwinelle. His mind was affected so much that when an old and intimate friend came from Vermont, whom he had longed to see, he did not know him; he looked at him vacantly, and did not recognize him. So that his mind passed away before his body. I indorse most heartily everything that has been said about Jehiel Parmly, and I feel gratified with Dr. Lord that this subject has been opened.

[Dr. Dwinelle moved that a committee to draft resolutions be appointed. The motion was adopted, and the chair appointed as such committee Drs. Dwinelle, Rich, and Kingsley.]

Dr. Brockway. If nothing better offers, I should like to read a letter which I have received, and, if possible, get the "sense of the meeting" upon it. The writer is a clergyman living in a remote country town in New England:

DEAR DR. BROCKWAY:—When you get a leisure moment, will you kindly give me your opinion upon an interesting matter I have observed here in this town, where I have lately settled.

I am told that almost everybody by or before the age of twenty has to have *false teeth*. This seems monstrous and unnatural, does it not? I write not simply from selfish considerations for my family's and my own sake, but to save, if possible, the teeth of the *parish!*

What can be the cause of such a state of things? Can it be the *climate*, the air of this hill-country (some nineteen hundred feet above the sea)? or is it more likely the mode of life of the people,—living and sleeping in rooms with close, air-tight stoves; and especially the food, which is quite limited in range, and not always well cooked besides?

It seems as if something was wrong which might be corrected. I take it, the causes are more likely to be individual and personal than congenital, though it is conceivable that personal and immediate causes working through several generations might, at least, tend to create an inheritance of poor teeth. Would a more silicious diet, as of the coarser grains or flours, be a partial remedy?

With apologies for the intrusion, I am, very truly yours,

X ——.

Dr. Bogue. I move that it be declared the sense of this society that the cause of the loss of teeth which Dr. Brockway refers to is cheap dentistry there or somewhere in that neighborhood.

Dr. Abbott. Or none at all.

Dr. Kingsley. It is not possible that such a state of things arises from climate, or food, or any other one thing. It is unquestionably partly an inherited condition helped along somewhat by the manner of living, and, perhaps, more than all, by want of personal attention and care. It is astonishing to see the total want of attention, the utter neglect, shown by young people throughout the country dis-

tricts. An inherited frailty accompanied with total neglect will create a constitutional condition that certainly will be transmitted, and the children will grow up worse than the parents.

Dr. Lord. I believe one cause of the loss of so many teeth to be the use of nitrous oxide gas as an anesthetic. [Applause.] Many persons will have their teeth extracted, when it can be done without pain, and there are some dentists who are so ignorant and unprincipled that they do not hesitate to extract, in any number of cases, where it is not required; and this practice obtains in the city about as much as in the country.

Dr. Rich. From the reading of that letter, I want to know what knowledge we have that that statement of facts is exactly so. Perhaps investigation in that region will tell a different story. I do not see how we can pass upon a thing that is so vague, that may be and may not be the case. Maybe a few persons came to his notice.

Dr. Brockway. This gentleman is a very intelligent man, and is especially well informed in regard to the teeth—remarkably so for a layman. I suppose the statement he has made is corroborated by his observation.

Dr. Rich. If a dentist living there were to send a report of that kind, it would be a very proper matter for us to consider and endeavor to ascertain the cause. All knowledge of that kind contributed to our profession is very valuable to us, and it would be valuable to us here to know what conditions produced results of that kind, if we know such conditions actually existed.

Dr. Abbott. I think that the condition mentioned in this letter is due, in the first place, to a want of care, and, in the second place, to poor dentistry. There is not a man in the practice of dentistry who has not time to teach the people how to keep their teeth in order. The want of such teaching is one very general cause of so many bad teeth. That, together with poor, cheap dentistry, is enough to render the members of any community toothless before they reach adult life. The "painless" extraction of teeth and the "cheap, beautiful" sets of teeth now put in all over the country have done much toward producing the state of affairs spoken of in the letter just read.

[Dr. Heitzmann then delivered an address on "The Minute Anatomy of the Teeth in the Light of the Bioplasson Theory," which appeared in the June number of the DENTAL COSMOS.]

Dr. Abbott. Mr. President,—In the researches which resulted in the publication of his "Three Memoirs on the Development and Structure of the Teeth and Epithelium," 1839, Nasmyth, it appears, discovered, after decalcifying sections of teeth, what he called "an interrupted or baccated appearance of the fibers." This, according

to his illustrations, consisted of numerous small branches running out from one canaliculus toward and sometimes joining and even crossing another; that these fibers or baccations contained living matter did not seem to occur to him. It appears, also, that he appreciated a certain organic structure of the enamel. I believe, however, that the first instance on record of a clearly-defined reticular structure of the organic portion of the enamel of a human tooth is that referred to in the paper I had the honor to read before this society in December, 1879, entitled "Caries of the Human Teeth," when I accidentally decalcified two specimens of enamel.

Dr. Niles, Boston. I have been very much interested and instructed by the lecture this evening, and shall not for an instant attempt to comment upon the subject without more study of Dr. Heitzmann's theory in regard to the structure of tissues. In speaking of the pathological condition of the dentine, he referred to the melting-out of the osseous portion. I should like to ask him if he has any theory as to the cause of the melting-out of the lime-salts.

Dr. Heitzmann. I purposely omitted in my lecture any hypothesis. All of us have our pockets full of hypotheses, but when it comes to the point of proving what we say we are lost?

It is a mere hypothesis, so far, that some acid plays a part in the melting of the lime-salts, and that lactic acid does it. Why inflammation starts, we do not know. It is easy to say that it is irritation of nerves and blood-vessels, but we are far from knowing why certain minute changes should produce a revolution called inflammation.

Dr. Dwinelle. Is it a new doctrine to assert that the enamel is vitalized? It seems to me that we all of us have specimens of the teeth showing where the tubuli and canaliculi encroach and pass into the enamel. I think I have some three or four specimens of that kind, and, if I am not mistaken, Dr. Abbott intimated that Nasmyth exhibited specimens of the same kind. I was pleased to hear Dr. Abbott say that he had decalcified enamel and found, after the lime-salts were taken away, its tissues were exhibited as plain as your hand.

Dr. Bödecker. When I made these researches on the enamel, I went through all the literature at my disposal, but found only one observer who said anything else but that the enamel-rods lay in very close proximity to one another; this was Alexander Nasmyth; but he does not say it is living substance which penetrates the dentine or the enamel; he says there is something between the enamel-rods looking like a web of membrane.

Dr. Dwinelle. And yet when we are exhibiting specimens we find the projections of the canaliculi and of the tubuli. Our explanation is, it is the canaliculi and tubuli that project into the substance of the enamel.

Dr. Bödecker. Dr. Dwinelle speaks of the dentinal fibers, which sometimes extend into the enamel for a little distance; this, certainly, has been known and described before, but we do not see every dentinal fiber run into the enamel. There are four varieties of connections in which the living matter of the dentine is continuous with that of the enamel, namely: a direct transformation of the dentinal into the enamel fiber; another communication is established, when the dentinal fibers that enter the enamel suddenly become enlarged, and form round or spindle-shaped bioplasson bodies with numerous offshoots connecting with the enamel fibers; sometimes the boundary between the dentine and enamel is wavy, and in these bay-like excavations we observe bioplasson bodies; frequently we find no distinct demarkation, but a gradual transformation of one tissue into the other, which is occupied by a finely granular zone, exhibiting an irregular net-work analogous to that of the basis-substance of dentine.

Dr. Niles. Through the basement-membrane?

Dr. Bödecker. I have not seen a membrane there.

Dr. Niles. Tomes supposes the existence of a membrane formed from the epithelial layer which dips down and incloses the enamel organ. Along its upper surface the enamel-rods first commence to form, and on the intermediate under-surface the dentine-germ forms the first dentine or layer of dentine-cells (odontoblasts.) It is impossible that the enamel-rods are, *in all cases*, continuous with the odontoblasts by organic or inorganic structure. That a membrane exists can hardly be doubted, though it is not conclusively proved. We know that in a well-calcified tooth the enamel and dentine are easily separated, especially when dry; this, with the fact of the origin of the enamel-germ, renders it possible for us to suppose that a membrane exists at the dividing-line between the enamel and dentine,—at least during its formation. The question I asked was, whether the means of communication was through this membrane into the enamel, and extending between the enamel-rods.

Dr. Bödecker. The communication is direct from the dentinal fiber into the enamel-fiber by means of a reticulum of living matter; the membrane is only imaginary.

Dr. Abbott. That is what Dr. Atkinson calls the interzonal space. We have a reticular structure of the enamel, as in the dentine, only it is finer and the fibers are much lighter. This, as I stated before, becomes granular in some instances, and the fibers are lost in the granular portion; from the opposite side of this protoplasmic mass they run off into the enamel. In many specimens, however, the fibers can be readily seen running from the dentine directly into the enamel unaltered in formation.

Dr. Niles. I wish to ask Dr. Heitzmann whether his discovery throws any light upon the question of calcification. He has discovered that cells have a reticular structure; does this prove whether in calcification of the dentine the cells themselves are calcified, or is calcification a product of the secretion of the cell?

Dr. Heitzmann. The gentleman touches upon a very delicate point. He very well pointed out the two essentially different views, one claiming it is secretion, and the other that the cell itself is transformed. I did not speak of this subject of development. The view formerly held by authorities, that the enamel-rods are epithelial bodies which directly become calcified by secretion, is entirely untenable. As I mentioned in my lecture, original epithelia break down into medullary corpuscles, and they are transformed into basis-substance. Even the old-fashioned conception of odontoblasts is a mistake, as Bödecker will show. The odontoblasts were thought to be epithelial bodies, from the top of which rise the dentinal fibrillæ. The odontoblasts are medullary corpuscles arranged in rows; fibers by no means originate from the top of the rows, but between them. In the formation of enamel, also, epithelia are formed into medullary corpuscles, from which the substance arises.

Dr. Abbott. Odontoblasts are formed around the pulp from one end to the other. The row, as we see it represented here, becomes infiltrated with lime-salts, and thus becomes a portion of dentine; another row of odontoblasts is formed, and, in turn, these are converted into dentine. The fiber of living matter contained in the canaliculi is formed from the coverings of the odontoblasts.

Dr. Bogue. The Yankees have the name of drawing practical inferences from the works of their more theoretical German brethren, and I should like to ask Dr. Heitzmann if we may draw a practical inference from what he has said that explains the theories held by our friend Flagg. He is continually telling us about compatibility of filling-material with tooth-structure. Dr. Heitzmann, in his remarks, alluded to the manner in which we should treat deciduous teeth, and closed by saying that a gutta-percha filling in a deciduous tooth was as thoroughly good a filling as could be put in there, basing that statement upon the non-irritating character of gutta-percha. It is but a single step further to include every filling-material we have, and I have not been able quite to settle in my own mind whether, in view of the different qualities of our filling-materials, compatibility is not more a mechanical than a chemical question. In other words, do not such fillings as amalgams, oxyphosphates, oxychlorides, etc., all of which are more dense than some tooth-structure, cause greater irritation and result often in breakage, which we perhaps mistake for caries? While, as we come to the softer

materials, gold heading them, tin next, and gutta-percha next, we find less and less disposition to break, greater adaptability, and less irritation,—if we are to accept the theory offered this evening,—resulting in less future decay.

Dr. Heitzmann. That is too much for me, for I am not a dentist. I told you, Gentlemen, what I offer is only a theoretical conclusion. What I am told about mechanical and chemical action and compatibility is no object for observation to me; neither of these expressions is correct. So long as a tooth is alive the foreign body that comes in contact with dentine will irritate. As to chemical action, I do not know whether such a thing does exist in the relation between the dentine and the filling-material. Where there is plenty of living matter, as in deciduous teeth, the irritation upon a solid filling will be more intense than upon a filling of soft protective material. I recommend light filling-material in deciduous teeth, for the reason that we have more living matter in them.

Dr. Bogue. I am glad to hear that these expressions are to be as corroborative as they are of the views I have taken, and, so far as any answer has been made, it corroborates them. My old preceptor, Dr. Westcott (of whom our secretary can, doubtless, tell a similar story) held about these views; and it has seemed to me that the lighter fillings put in deciduous teeth have done better than denser ones, and men who held that doctrine have done better with children's teeth.

Dr. C. N. Peirce, Philadelphia. The card from the secretary announcing the subject for consideration this evening at once attracted my attention, and I have nothing to regret in having made the effort to be present.

The lecture which has been so intelligently illustrated upon the black-board is certainly upon a subject of great interest, and, though the views advanced are somewhat at variance with previous histological teaching, they are endowed with a deep interest, because they are the result of the observations of an industrious and earnest worker. If I have correctly understood the diagram and the explanations given by the lecturer, the amœba, which has usually been regarded as a homogeneous mass, has been figured and described as quite a differentiated structure, made up of granules and a reticulated tissue, and subjected to modifications in the growth, nutrition, and movements of the animal, and especially so, as he has described the lines which give the reticulated appearance, as lengthening and contracting with the projection or retraction of the improvised arms; also, corresponding with this change, do the granules diminish and increase in their size. This reticulated appearance, which represents the structure of the amœba, as observed

by the lecturer, is given here as also representing the protoplasmic strings and the organic part of the dentinal tissue. If this theory is correct it will certainly give us a very definite idea of the permeation of the dense dentine by the organic matter, and also a very plausible theory respecting the sensibility and recuperative power which so thoroughly permeates this tissue.

In reference to the inquiry of Dr. Bogue respecting the compatibility of filling-material with different teeth, I think every observing dentist recognizes the fact that we have to deal with teeth varying very greatly in their sensibility, irritability, recuperative power, and density, and that these conditions are modified by age, systemic conditions, diet, and location or habitat. While teeth at one time will tolerate nothing but gutta-percha or a phosphate cement, at another period, probably later in life, the same teeth can be filled to great advantage and comfort with gold or amalgam.

It is the recognition of these varying conditions of our patients and their teeth that distinguishes the intelligent dentist from the charlatan, and necessarily places the results of the labor of one superior to and upon a much more satisfactory basis than that of the other. [Applause.]

Dr. Dwinelle. I think we all recognize that general principle in all our practice. We cannot make all our shoes off one last. Sometimes a patient is at par and oftentimes below par, sometimes above, and we have to take these things into consideration, and especially in dealing with young patients, where recalcification has not taken place, we are obliged to resort to soft materials. Tin has been the metal that I have used in preference to others. I have for the few years past used amalgam and other materials, gutta-percha, etc.

Dr. Atkinson. The time is nearly spent, and there is an immense amount of interesting matter before us; whether there is ability to digest it and properly elucidate it or not remains to be seen. I would like to call attention to the "imperfect" condition which was presented to us.

There was a point or two in the morphic and nutrient currents of which Dr. Heitzmann did not speak in his plan of the adaptability of the structure to the forms in agreement with which it is to be built out of this material which he calls "indifferent corpuscles."

Just here we are in the maze of contradictions respecting the processes in organogeny by which unseen types present themselves in visible structures, which constitute the elements of tissues, organs, and bodies. Whether these arise spontaneously or from parentage depends upon what we understand spontaneity and parentage to be. The epiblast and hypoblast are formed in every case of development arising from an impregnated egg.

After the subdivision of the mass of the ovum into the foundation foresteps in the segmentation cavity these undifferentiated elements make their appearance, including the egg-shell, which is a source of supply from which the protoplasm is evolved, from which the various tissues are built and nourished. Sometimes the mesoblast arises out of the epiblast, and at other times out of the hypoblast. Sometimes it is scarcely distinguishable as a separate membrane or fold from the membrane out of which it proliferates to be wrought into the tissues of the body by a series of metamorphoses of those corpuscles which mark the various stages of evolution in the chick or other embryo coming out of this formative material, each form according to the type of organism or the parentage from which it sprang, whatever that may be.

In the lower class there is some doubt whether there is a provable mesoblast out of which the proto-vertebral or "somites" arise in that case. Until this is settled we are unable to verify the assertions or suggestions of the different authors as to whether these are the source of the *nerve*-plates, *muscle*-plates, and *bone*-plates which become the machinery of bodily function.

The agreements or disagreements between the behests of "typal" demands and "molecular" habits constitute the measures of healthy and unhealthy (or diseased) condition, the latter being the "imperfect" condition referred to by Dr. Heitzmann. When these fine currents of morphic and nutrient changes are revealed so as to be taken hold of by the senses, we shall become masters of the situation and be able to deal with the progresses and regresses of these movements, so as to formulate the metamorphoses through which *atoms* pass in forming *molecules*, by which these become *granules*, out of which *corpuscles*, *tissues*, *organs* and *systems* arise. This serial order of change, when uninterrupted, presents us with healthy bodies capable of displaying the full measure of energy belonging to functioning body in endowment of form, size, longevity, and individual characteristics that distinguish individuals from masses in all the orders, classes, genuses, species, and varieties in bodies subjected to investigation; but when from any antecedent impact of energy these demands (of type and formed or forming body) are at cross-purposes, we have debilitated, diseased, or dead bodies. It is plain, then, that this is too deep and complicated a subject to more than merely hint at in detail and in an off-hand, condensed manner, in a running speech; therefore, we may as well stop right here.

Adjourned.

DENTAL SOCIETY OF THE STATE OF NEW YORK.

THE fourteenth annual meeting of this society was held at Albany, N. Y., May 10 and 11, 1882.

The following officers were elected for the ensuing year: L. S. Straw, Newburg, president; Frank French, Rochester, vice-president; J. Edw. Line, Rochester, secretary; A. H. Brockway, Brooklyn, treasurer; W. H. Atkinson, New York, correspondent.

J. EDW. LINE, *Secretary.*

KENTUCKY STATE DENTAL ASSOCIATION.

THE annual meeting of the Kentucky State Dental Association was held in Louisville, June 7 and 8, 1882. The following were elected officers for the ensuing year: J. Hooper, Owenton, president; R. C. Morgan, Stanford, vice-president; J. F. Canine, Louisville, treasurer; C. E. Dunn, Louisville, secretary; A. O. Rawls, Lexington, and M. L. S. Buckner, Shelbyville, members of the board of censors; A. W. Smith, Richmond, State examiner.

PITTSBURGH DENTAL ASSOCIATION.

THE eighth annual meeting of the Pittsburgh Dental Association was held in Pittsburgh, Pa., May 9, 1882, the president, Dr. W. F. Fundenberg, in the chair.

The following officers and delegates were elected for the ensuing year: Dr. H. Manchester, president; Dr. J. S. Goshorn, vice-president; Dr. W. H. Fundenberg, secretary; Dr. C. E. Diehl, treasurer; Drs. F. A. Reinhart, F. H. Deterding, A. H. Greenawalt, D. C. Phillips, and W. H. Fundenberg, delegates to the American Dental Association; Drs. J. S. Goshorn, C. W. Beacom, F. A. Reinhart, H. L. Reinecke, and F. Troth, delegates to the Pennsylvania State Dental Society.

Adjourned to meet on the second Thursday of September, 1882.

W. H. FUNDENBERG, *Secretary.*
323 Pennsylvania Avenue, Pittsburgh, Pa.

AMERICAN DENTAL ASSOCIATION.

THE twenty-second annual session of the American Dental Association will be held at Cincinnati, commencing on Tuesday, Aug. 1, 1882.

GEO. H. CUSHING, *Recording Secretary.*

The meeting will be held in the hall of the Highland House, situated on Mt. Adams, about five hundred feet above the city, and easily

accessible by street-cars and inclined railway. The location chosen is always delightfully cool, even in the warmest weather.

The Gibson House, Walnut Street, between Fourth and Fifth, will be headquarters, with first-class accomodations at $2.50 per day for those in attendance on the meeting.

Transportation.—A reduction of rates has been secured on the following railroads:

The Ohio and Mississippi Railroad will return those attending the meeting who have paid full fare coming to Cincinnati, on certificate of secretary, to St. Louis for $3.90, and to Louisville for $1.50, and to all intermediate points at the rate of one cent per mile.

The Cincinnati and Louisville Short Line Railroad agree to the same rates between Louisville and Cincinnati.

The New York, Pennsylvania, and Ohio Railroad, from Salamanca and intermediate points to Cincinnati, will return those attending the association at one cent per mile, on certificate of secretary.

Cincinnati, Indianapolis, St. Louis, and Chicago Railway—"Kankakee Line," between Cincinnati and Chicago; "Big Four and Vandalia Line," between St. Louis and Cincinnati—will return those attending the meeting at rate $3.00 to Chicago, $3.90 to St. Louis, and one cent per mile to Indianapolis, Lafayette, Sheldon, Kankakee, and intermediate stations, on certificate that they paid full fare going.

The Cincinnati, Hamilton, and Dayton Railroad will make same rates as other routes to Indianapolis, Richmond, Chicago, Toledo, etc.

The C., C., C. and I. Railway, from Cleveland to Cincinnati, will also return all attending the association at one cent per mile.

The Cincinnati Southern Railroad will return those who have paid full fare coming for two cents per mile.

The Pittsburgh, Cincinnati, and St. Louis Railway (Pan Handle Route) will furnish round-trip tickets at two cents per mile, from Pittsburgh to Cincinnati and all intermediate points, to all who will present orders for the same at their respective starting-places. These orders for round-trip tickets may be obtained by addressing J. Taft, Cincinnati, Ohio.

The Baltimore and Ohio Railroad will sell excursion tickets, between Parkersburg and intermediate points and Cincinnati, at two cents per mile each way, to those attending the association.

The Chesapeake and Ohio Railroad, extending to Washington, D. C., and Richmond, Va., reaching Cincinnati *via* Lexington, Ky., on the Kentucky Central Railroad, will return those attending the association, from these and all intermediate points reached by this railroad and its branches, at one cent per mile, upon certificate from secretary of association. These tickets will be good for stopping over

at any point of resort or interest on the road. The White Sulphur Springs are on this route.

J. TAFT,
G. W. KEELY, } *Committee of Arrangements.*
C. R. BUTLER,

AMERICAN DENTAL CONVENTION.

THE twenty-eighth annual meeting of the American Dental Convention will be held in the Town Hall, Saratoga Springs, on the 8th of August, at 11 A.M. Members will convene at the United States Hotel prior to the meeting. Arrangements have been made for the accommodation of guests at reduced rates.

Papers and addresses are promised from prominent members of the profession. Dr. T. W. Evans, of Paris, is expected to deliver the opening address.

All dentists in good standing are entitled to membership.

The committee hope to make this meeting the most entertaining one which has been held for many years, and to this end desire the co-operation of the profession throughout the country. Several important improvements will, it is expected, be exhibited.

All information respecting the meeting will be cheerfully given by Dr. John Allen, president, No. 7 West Thirty-eighth Street; Dr. H. Townsend, vice-president, 1514 Vine Street, Philadelphia; Dr. A. C. Rich, secretary, Saratoga Springs; Dr. J. G. Ambler, No. 16 East Forty-second Street, New York, chairman of committee of arrangements.

NATIONAL DENTAL ASSOCIATION OF THE UNITED STATES OF AMERICA.

THE next meeting of the National Dental Association of the United States of America will be held in Washington, D. C., in the lecture-hall of the National Museum of the Smithsonian Institution, on the 3d, 4th, and 5th of August, 1882.

The meetings of the association in Washington are quadrennial and international. A cordial invitation is extended to all members of the profession in this and other countries to attend this meeting.

R. FINLEY HUNT, *Secretary*, Washington, D. C.

SOUTHERN DENTAL ASSOCIATION.

THE fourteenth annual meeting of the Southern Dental Association will be held in the city of Baltimore, Md., commencing Tuesday, August 8, 1882. A cordial invitation is hereby extended to all dentists to attend.

W. H. HOFFMAN, *Secretary.*

AMERICAN DENTAL SOCIETY OF EUROPE.

The American Dental Society of Europe will hold its tenth annual meeting at Ostende, Belgium, beginning on Monday, August 7, 1882.

Especial efforts are being made to make the meeting one of interest and profit, and all members of the profession are cordially invited to attend.

Willoughby Miller, *Secretary*, Berlin.

PENNSYLVANIA STATE DENTAL SOCIETY.

The Pennsylvania State Dental Society will meet at Williamsport, July 25, 1882, at 10 o'clock A.M., and continue its sessions three days.

Papers will be read and demonstrations of methods of practice will be given by prominent members of the profession from this and other States. The committee will be glad to receive volunteer papers or anything new in dentistry or pertaining to it. They have the assurance that several novelties will be exhibited. Hotel rates at the Park House (late Herdic House) reduced to $2.00 per day to those in attendance on the meeting.

All dentists are invited to be present. Applications for excursion tickets or for any information should be made to

W. H. Fundenburg, *Cor. Sec.*,
323 Penn Ave., Pittsburgh, Pa.

WISCONSIN DENTAL SOCIETY.

The twelfth annual meeting of the Dental Society of Wisconsin will be held in Milwaukee, commencing Tuesday, July 18, 1882, and closing Friday, the 21st, at 5 P. M. A cordial invitation is extended to members of other dental societies, and also to the medical profession, to be present. The usual reduction in hotel and railroad fares has been arranged for.

Walter F. Lewis,
William Decker,
C. E. Gridley,
} *Executive Committee.*

NEW JERSEY STATE DENTAL SOCIETY.

The twelfth annual session of the New Jersey State Dental Society will be held at Leland's Ocean Hotel, Long Branch, commencing Wednesday, July 19, 1882, and continue until adjournment. The board of examiners will meet at 10 A. M. on the 18th for the examination of candidates for license to practice. The profession generally are most cordially invited to attend.

Chas. A. Meeker, *Secretary*, Newark.

MAINE DENTAL SOCIETY.

The Maine Dental Society will hold its seventeenth annual session at Dexter, Tuesday and Wednesday, July 18 and 19, 1882, commencing Tuesday evening. A general invitation is extended to dentists and others interested to attend the meetings.

D. W. Fellows, *Secretary*, Portland, Me.

CENTRAL PENNSYLVANIA DENTAL ASSOCIATION.

The Central Pennsylvania Dental Association will meet at Tyrone, July 24, 1882, at 10 o'clock A.M., for one day only. A good programme has been arranged, and a full attendance is expected.

J. D. Geissinger, *Secretary*.

EDITORIAL.

DENTAL LEGISLATION IN MISSISSIPPI.

The following is the text of "An Act to Regulate the Practice of Dentistry in the State of Mississippi," which became a law February 25, 1882:

"An Act to Regulate the Practice of Dentistry in Mississippi.

"Section 1. *Be it enacted, by the Legislature of the State of Mississippi*, That it shall be unlawful for any person, who is not, at the time of the passage of this act, engaged in the practice of dentistry, to begin such practice unless such person shall have received a diploma from the faculty of some reputable dental college duly authorized by the laws of this State, or some other of the United States, or of some foreign country, in which college granting such diploma there was at the time of such granting annually delivered a full course of lectures and instructions in dental surgery, unless such person shall comply with the other provisions of this act; *Provided*, however, that the provisions of this act shall not apply to any person holding the diploma of doctor of medicine from any reputable medical college; and *provided further*, that nothing in this act shall be construed as to prohibit any person from extracting teeth.

"Sec. 2. *Be it further enacted*, That a board of dental examiners, consisting of five practicing dentists, be hereby created, whose duty it shall be to carry out the purposes and enforce the provisions of this act. The members of said board of dental examiners shall be appointed and commissioned by the Governor of this State. Their terms of office shall be for five years, excepting that the members of the board of examiners first appointed, for one, two, three, four, and five years respectively, as designated by the Governor, until their respective successors shall be duly appointed and commissioned. All vacancies occurring in the said board of examiners may be filled by the Governor at any time.

"Sec. 3. *Be it further enacted*, That said board of dental examiners shall elect one of their number president and one the secretary thereof, and shall meet at the State capital, always giving thirty days' previous notice of such meetings, by publication in some newspaper printed and published in the city of Jackson.

A majority of said board shall constitute a quorum. Full minutes of their proceedings shall be kept, which shall always be subject to public inspection as any other public records.

"SEC. 4. *Be it further enacted*, That every person engaged in the practice of dentistry in this State shall, within ninety days from the date of approval of this act, cause his or her name and residence or place of business to be registered with said board of examiners, who shall keep a suitable book for that purpose, and every person who shall be so registered, may continue the practice of dentistry in this State without incurring the penalties provided for in this act.

"SEC. 5. *Be it further enacted*, That any person now engaged in the practice of dentistry in this State, failing to register as provided for in section four of this act, shall not be permitted to continue such practice until such person shall have been examined by said board of examiners and regularly licensed in accordance with the provisions of this act.

"SEC. 6. *Be it further enacted*, That if the said board of examiners shall willfully fail or refuse to register any name presented to them within the time and in pursuance of section four of this act, and issue a certificate to such persons, the members of said board of examiners so failing or refusing shall be held guilty of a misdemeanor, and upon conviction be punished accordingly.

"SEC. 7. *Be it further enacted*, That any person who may do so, and being of lawful age and good moral character, may appear before said board of examiners at any of its meetings, regular or called, and be examined touching such applicant's knowledge, skill, and proficiency in dental surgery; and upon such examinations proving satisfactory said board of examiners shall issue a license, signed by the president and countersigned by the secretary, to such applicant to practice dentistry in this State. And such license shall be impressed with the seal of Mississippi State Dental Association. Any graduate of any reputable dental college may obtain at any time, without examination, such license upon presentation of diploma and the payment of a fee of two dollars to said board of examiners.

"SEC. 8. *Be it further enacted*, That any member of said board of examiners may issue a temporary license to any applicant, after a satisfactory examination touching the skill and proficiency of the applicant, the license to remain effective only until the next regular meeting of the board; *Provided*, That no such temporary license shall be granted to any applicant who has been rejected by the board of examiners.

"SEC. 9. *Be it further enacted*, That said board of examiners may charge and collect from any person appearing before them for examination for license to practice dentistry a fee of five dollars, and for every license issued to graduates from dental colleges a fee of two dollars, as hereinbefore provided; and all such fees shall be paid over into the treasury of the Mississippi State Dental Association. Out of the fund thus created said board of examiners may receive such compensation as may be fixed by said State Dental Association, subject to be changed from time to time, as said association may determine. But no part of such compensation, or any of such expenses shall ever be paid out of the State treasury.

"SEC. 10. *Be it further enacted*, That any person licensed by said board of examiners shall, before beginning to practice dentistry, pay the privilege tax which may be required by the general statutes of this State, and have his license from the said board of examiners recorded in the deed records of every county in which he may desire to practice his profession.

"SEC. 11. *Be it further enacted*. That any violation of the provisions of this act shall be a misdemeanor and punishable as such, the fine in no case being less than ten dollars.

"SEC. 12. *Be it further enacted*, That this act take effect from and after its passage."

The board of examiners appointed by the Governor under this act consists of Drs. A. K. Northrop, Pass Christian, for one year; A. H. Hilzheim, Jackson, for two years; M. C. Marshall, Winona, for three years; A. A. Dillehay, Meridian, for four years; W. T. Martin, Yazoo City, for five years.

OBITUARY.

DR. D. C. HAWXHURST.

AT a meeting of the Chicago Dental Society, held May 2, 1882, the following preamble and resolutions were unanimously adopted:

WHEREAS, It has pleased the Supreme Judge of the Universe to call from among us our esteemed friend and associate, the late Dr. D. C. Hawxhurst, of Battle Creek, Mich., whose untimely decease was due to his untiring efforts in the pursuit of professional knowledge; and

WHEREAS, We have been deprived of the companionship and counsel of our brother, whose ability and learning, unsullied reputation, and high sense of honor have endeared him to the memory of his associates, it is right and proper that we should show with what feelings of deep regret and sorrow we learned of his untimely death; therefore

Resolved, That in the early decease of Dr. D. C. Hawxhurst our profession in general, and the Michigan State Dental and Medical Associations in particular, have lost a useful, wise, and good brother;

Resolved, That his generous, manly character and studious habits command our admiration, and his example our earnest following;

Resolved, That to the family of the deceased we tender our heartfelt sympathy in this their time of bereavement and mourning;

Resolved, That a copy of these resolutions be sent to the family of the deceased, to the Michigan State Dental and Medical Associations, and a copy transmitted for publication to each of the dental journals.

T. W. BROPHY,
A. W. HARLAN,
GEO. H. CUSHING. } *Committee.*

A CARD
TO THE DENTAL PROFESSION.

A MEETING of dental dealers and manufacturers for consultation upon the interests of the trade in dental goods was held in Pittsburgh in February last. It was there decided to form a permanent organization, and this was consummated at a meeting held at Niagara, June 21.

Through a misapprehension of the objects of this association by some members of the dental profession, the fear has been expressed

that the intention was to combine for the purpose of raising prices, and in other ways to work injury to them.

It is the purpose of this paper to set forth the objects of the association, and to show that apprehensions of injury to the dentists by its operations are entirely unfounded.

Number 2 of the Articles of Association sets forth the purposes of the organization, as follows:

"The objects of this association are, to reform abuses; to secure unity of action; to promote a friendly intercourse between its members; to avoid and adjust, as far as possible, differences and misunderstandings between them, and generally to advance the interests of the trade in dental goods in the United States."

This article is an honest and full expression of the objects of the association. In their business relations the dentists, the dealers, and the manufacturers are a necessity, each to the others, and whatever really injures one class will eventually injure the others. Neither manufacturers nor dealers can legislate against the *true* interests of their customers without in the end injuring themselves.

The dealers in dental goods in this country have suffered for some years from wrong business methods. These have grown very largely out of a want of intimate acquaintance and intercourse, leading frequently to unnecessary and unwise competitions which largely increased expenses and losses by bad debts, and which, while benefiting a few customers, worked a positive injustice to many others.

Organization will tend to correct these evils, and, by periodical meetings, intercourse, and discussion, information will be diffused, misapprehensions will be corrected, and the interests of all concerned will be promoted.

The dentists themselves long since decided that organizations with frequent meetings for the interchange of ideas and information are of inestimable value. It is believed that they will not be disposed to condemn, *a priori*, a plan for others which they have found so beneficial for themselves, but that they will be willing to accord to the dealers the privileges of organization without fear that the association will be used by its members against the interests of those who are in business their best friends.

The business of a dealer in dental goods must, of necessity, be of a limited character,—very different from that of a dealer in dry-goods, groceries, iron, or lumber; dealers in these articles have the entire population of the country for customers, while the number of *dentists* in the country is hardly more than twelve thousand.

One may be led to invest in luxuries for the table, in more fashionable garments, or more elegant furniture, without in any way reducing his *needs* for the future. Not so, however, with the business

wants of the dentist; these are strictly limited to his practice, and if in any year he is led to buy more gold foil, rubber, teeth, instruments, etc., than his practice requires, his future purchases will be diminished in exact proportion. It is from forgetfulness of this fact, and from treating the wants of the dental profession as practically unlimited, that the wrong methods above referred to have mainly arisen, and they have wrought injury to both dealer and dentist.

I. The dealers have engaged very vigorously in a system of traveling far and wide which has added largely to their expenses without proportionately increasing their profits; in some sections of the country they have crossed one another's tracks continually, often to the great annoyance of dentists, who have too frequently been called from patients to wait upon canvassers. Some have been led to give away a portion of their legitimate profits in order to make sales, and with this has been the inevitable tendency to press the sale of inferior goods in order to keep up profits. Some have been persuaded to give unwarrantable credits, and thus to incur unnecessary losses from bad debts.

The tendency has been in the direction of increasing expenses, increasing losses, constantly decreasing net profits, inferior quality of goods, and, in short, toward the degeneracy of the trade.

II. The dentists have been injured by this system in several ways:

1. It has wrought injustice to the many by the favors and concessions that have been given to the comparatively few. Cases were reported at Pittsburgh of three dentists in the same town, having the same kind of practice, yet each paying a different price for the same goods; of a dentist who, by shrewdly setting three dealers to bidding against each other, purchased his office-chair, etc., at nearly twenty-five per cent. less than his neighboring competing dentists were paying. It was shown that the dentist who had the most time to canvass among the dealers, or who could succeed in causing two or more dealers to bid against each other, and the dentist who lived on the routes most frequented by travelers, were the ones who received favors in price and credit; while the confiding one who ordered of his dealer without bargaining, in the belief that he would be as well served as any, the busy dentist who had not time to shop, and those not so frequently visited by canvassers, were charged full rates, and therefore, as compared with the others, were treated unjustly.

These irregularities have, it is true, been limited, though of late the tendency has been to extend them, and it is undoubtedly true that far more than a majority of the dentists of the country have, by these practices, been placed at a disadvantage as compared with the minority.

The dealers' association proposes to correct this by adopting uniform rates for the same kind of goods, and treating all with equal fairness.

A schedule of discounts for large, strictly cash purchases has been adopted, and by giving all customers the benefit of it, the gross profits of the dealers will not be enhanced, and the dentists of the country, as a whole, will pay less for their supplies than under the old methods.

2. The competition on the road and the desire to do a larger business than is warranted by the nature of the trade have been to the dentist fruitful sources of debt, that in many instances has proved burdensome and embarrassing.

The temptation of long credit as an inducement to buy large bills in advance of any reasonable wants has been freely offered. Many dentists have thus been burdened through promises from salesmen of a credit "as long as convenient"—promises which the principals have not known of or consented to, and the result has been misunderstanding and ill-feeling.

Believing that, as a rule, it is no kindness to the average professional man to induce him to incur debts beyond his needs for a moderate and reasonable time, the aim of the association will be rather to offer inducements for cash transactions than to endeavor to make sales by offers of unreasonable credit. It is believed that the relations between dentist and dealer will be strengthened, and that both will be benefited by this course.

3. The late methods of business have had the tendency to cause dentists on traveled routes to rely more upon travelers than upon their nearest local dealer. By encouraging him with his trade the dentist will enable his dealer to keep a better stock and to supply his wants as they arise, without the inconvenience of waiting for travelers.

One object of the association is to enable the dealer to supply his own local trade at as low a rate as any others can, and, of course, more promptly.

4. A far more serious matter to the dentist than those above referred to is the inevitable tendency of an eager competition for cheapness toward depreciation in the quality of the goods offered. It has been truly said that "a competition for cheapness and not for excellence of workmanship is the most frequent and certain cause of the rapid decay and entire destruction of arts and manufactures."

No inducement that can be offered in the way of lower prices can in the slightest degree compensate for such depreciation. The greatest injury that can be inflicted upon the dentist, in view of the

operations which he has continually to perform, is to supply him with inferior materials, appliances, and instruments. Most emphatically, in his case, "the best is the cheapest." There has been of late, as there must always be where a competition for cheapness exists, a tendency toward inferior goods.

The association will, indirectly, and yet surely, operate to correct this, and to place competition on the nobler ground of contest for excellence in quality rather than for cheapness in price.

The association is not a combination for the purpose of establishing a schedule of prices for dental goods. Differences in quality and in prices have always existed and will continue to exist. Any attempt to harmonize these differences would obviously be impracticable. The various manufacturers of teeth, instruments, etc., will, as heretofore, make their own prices on their own products; but as manufacturers of dental supplies are also retailers, it is understood that whatever prices are established, or whatever alterations in prices are made, the facts shall be announced to the dealers, so that they shall have the privilege of selling as low as the manufacturer, and, on their part, it is understood that the manufacturer shall not be undersold on his own goods.

So far as prices are concerned, this is all there is in the organization. It does not make prices; it does not seek to control the manufacturers, nor to establish uniformity as to quality or price,—these points are left open to wholesome competition,—but it does seek to bring the dental trade to the one-price system *on the same goods*,—a fair and just system which, once established, will give assurance to each customer that he is paying the same price for the same goods that his neighbor pays; and that without loss of time or temper in canvassing among different dealers.

Such a system cannot fail to commend itself to all fair men.

In brief, the *American Dental Trade Association* hopes, by correct business principles and methods, by associated action, by social intercourse and business conferences, to be an attraction and a benefit to its members; and it desires, by careful attention to the wants of the profession, and a constant effort to aid in the progress of dentistry, by fair dealing with every buyer, by an honest purpose to serve faithfully those who look to its members for supplies, by the assurance that the buyer who sends his order confidingly will surely receive as low rates as if he spent his time in bargaining, and that no competitor will receive special favors in prices, to commend itself to the confidence and esteem of the entire dental profession.

THE AMERICAN DENTAL TRADE ASSOCIATION.

J. Littlefield, *President.*

Lee S. Smith, *Secretary.*

THE

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ORIGINAL COMMUNICATIONS.

THE MINUTE ANATOMY, PHYSIOLOGY, PATHOLOGY, AND THERAPEUTICS OF THE DENTAL PULP.

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(Read before the New York Odontological Society, March, 1882.)

[Continued from page 345.]

II.—History.

A great deal has been written on the dental pulp. From the time of Prochaska (1780) to the present many essays have appeared, or have been read before dental societies, but the number of those who have advanced scientific knowledge in this direction is very small. J. Tomes, E. Albrecht, Heider, C. Wedl, R. Hohl, Boll, J. Bruck, R. Baume, and A. Witzel ought to be especially mentioned as having contributed very much valuable information to our knowledge of the dental pulp. The literature of the subject is too voluminous to allow me to mention all who have written upon it, and I will therefore only make short extracts from a few of the most prominent authors.

The earliest treatise on the dental pulp which I have been able to trace is by Galen ("Systemisches Handbuch der Zahnheilkunde," von Georg von Carabelli; Wien, 1844), who was born A.D. 131. He said, "I felt the pulsation in a tooth that was aching in the same way as in other inflamed soft parts. I wonder that a tooth can be inflamed. But when I again suffered from toothache I distinctly felt that this was not caused by the tooth, but the inflamed gum. By having had both kinds of pain, I positively know that the seat of the one pain was in the gum, but the other was in the tooth." He was also the first to observe that the teeth are provided with soft nerves.

John Hunter says, "A tooth very often wears down so low that its cavity would be exposed if no other alteration were produced

in it. To prevent this, nature has taken care that the bottom part of the cavity should be filled up by new matter, in proportion as the surface of the tooth is worn down."

Georgii Prochaska ("Operum Minorum Anat. Physiol. et Path. Argumenti," Pars II.; Viennæ, 1800) also called attention to the fact that when by attrition the teeth on their upper surfaces are worn there is produced within the pulp-chamber just as much new material as is worn away on the outer surface.

Rousseau ("Anat. Comp. du Syst. Dent. Chez l'Homme et Chez les Princip. Anim.;" Paris, 1827) found "osteoids" and bony growths in the pulp-cavity, but states that Bertin had known this before him.

Bertin ("Über Neubildungen der Zahnpulpa von Rudolph Hohl;" Halle, 1868) says, "The teeth are not empty, but filled with a soft mass, which originated from a lymphatic fluid. This fluid thickens by evaporation without obtaining the consistence of bone, although sometimes this substance does form hard masses, not in connection with the other tissues originally, which, however, later are united with the dentine."

Thomas Bell ("The Anatomy, Physiology, and Diseases of the Teeth;" Philadelphia, 1830), in speaking about mechanical abrasion, says, "We find that, instead of these teeth being the subject of absorption, a new deposition of bony matter is, in fact, going on to fill the cavities, which would otherwise be exposed. It is first deposited in that part of the cavity toward the worn surface, and becomes gradually more and more filled as the tooth becomes abraded."

Raschkow ("Meletemata Circa Mammalium Dentinum Evolutionem;" Warschau, 1835) found stony masses in the molars of deer, hares, and pigs.

A. Nasmyth ("Researches on the Development, Structure, and Diseases of the Teeth," 1849) says, "Much diversity of opinion has already existed respecting the connection of the pulp with the ivory of the tooth, and as to whether the ivory be simply a product of the pulp or a transformation of its substance. The formative surface of the pulp displays a regular cellular arrangement. The radiating rows of cells are surrounded by a well-defined scolloped border, from which occasionally processes are observed to project at regular intervals." This author also, on page 226, plate vi., describes and nicely depicts several cases of ossification of the pulp.

R. Owen ("Odontography," vol. ii.) illustrates a new formation of osteo-dentine from a bicuspid tooth developed with hair in a cyst of the human ovarium.

F. Ulrich ("Zeitschr. der Kk. Gesel. der Ærzte zu;" Wien, 1852)

noticed new formations of the dental pulp, of which he described three varieties, viz., the dentinoid, the osteoid, and a mixture of the two tissues in one.

P. B. Goddard ("The Anatomy, Physiology, and Pathology of the Teeth;" New York, 1854) described the dental pulp as composed of granular matter invested by a delicate membrane or epithelium.

Kölliker ("Gewebelehre;" Aufl IV.) noticed new formations of dentine and cement on the walls of the pulp-cavities of teeth.

From L. S. Beale ("On the Structure and Growth of the Tissues, and on Life," 1865) I abstract as follows: "The tissue of the pulp, it must be distinctly borne in mind, is not converted into dentine; neither does dentine, nor the tissue from which it is formed, exhibit any characters which justify our classifying it with the connective tissues. * * * No dentine was ever produced except by the agency of the so-called 'cells.' I agree with Kölliker and Lent, that the dentinal cells are the only active agents concerned in the formation of the dentine, but cannot regard the canals as direct processes of the whole dentinal cells, nor admit that the matrix is an intercellular substance. The mass of the pulp is composed of a simple form of connective tissue, with numerous oval and triangular corpuscles (germinal matter) not unlike that of which the mucous tissue of the umbilical cord consists."

R. T. Hulme ("On Calcifications of the Dental Pulp," Transactions of the College of Dentists of England, 1861) gives a good description of the new formations in the pulp-cavity. He names four varieties, viz., secondary dentine, dentine of repair, osteo-dentine, and nodular dentine, but he is of the opinion that the term "secondary dentine" would suffice for all varieties. He beautifully illustrates in two plates ten cases of new formations, one of which is copied from Salter, "Guy's Hospital Reports" of 1853.

From John Tomes ("System of Dental Surgery;" London, 1873) I quote, "The opinion held by Waldeyer, Boll, Beale, and many others, that every part of the dentine is a direct product of the conversion of the odontoblasts. This view is probably the true one. * * * The odontoblasts close up to the dentine are in actual contact with one another, and there is no room for an intercellular substance. * * * The most external portions of the odontoblasts undergo a metamorphosis into a gelatigenous matrix, which is the seat of calcification, while their most central portions remain soft and unaltered as the fibrils. According to this view, the fibril, the sheath, and the matrix are but three stages in the development of the same tissue. * * * Some pulps will be found to contain numerous nodules of dentine; in others the greater part of the pulp will be found converted into secondary dentine. Or the calcification of the pulp may

be limited to the production of a patch of dentine added to the wall of the pulp-cavity. Small isolated calcareous globules are to be found in perfectly healthy developing teeth."

From E. Albrecht ("Die Krankheiten der Zahnpulpa;" Berlin, 1858) I copy, as follows: "The principal change of the teeth caused by the pulp is the phenomenon of calcific deposits, which are found partly on the walls of the pulp-cavity and partly within the pulp-tissue. * * * The globular masses in older teeth are not to be regarded as normal but anomalous formations, although sometimes the canaliculi of the dentine have grown through them. The globular masses show some striped formations with a radiatory arrangement, the center of which is occupied by a dark-colored empty space of irregular shape, and provided with several offshoots, looking like a bone-corpuscle, in which sometimes roundish cell-like formations, with nucleus-like contents and offshoots, are seen. * * * By the formation of pus in a small place near these globular masses, on the wall of the pulp-cavity, it may occur that some of this substance is destroyed and a cavity formed, which later on, by a less normal formation of dentine of repair, is separated from the pulp-cavity and filled with pus, thus representing an abscess in the dentine."

From R. Hohl ("Ueber Neubildungen der Zahnpulpe;" Halle, 1868) I cite, as follows: "New formations of the dentine are found within the soft tissue of the pulp as well as on its periphery in connection with the primary dentine. The former are present in the shape of small hemp-seeds; the latter from their origin are connected with the walls of the primary dentine, and always grow where, on the corresponding outer surface of the tooth, loss of substance has occurred. * * * This formation has been called 'dentine of repair,' and protects the pulp-cavity from exposure. The other formations, however, being found loose in the pulp, are not designed for any purpose of repair. * * * The free odontomes are easily distinguishable by the naked eye; they may, however, be mistaken for calcifications, which, in their form, are identical with odontomes. * * * The microscopical structure of these formations presents the following deviations from normal dentine: their canaliculi run in all directions, especially in those formations found loosely imbedded in the pulp-tissue. Now and then the dentinal canaliculi enlarge like a sack, or terminate in large holes, which, however, ought not to be regarded as bone-corpuscles. * * * Osteo-odontomes are mixed formations, and show dentine in one and cement in another place. * * * Osteomata are found both free and adhering to the walls of the pulp-cavity. The bone-corpuscles are found sometimes analogous to those of the cementum; at others

they are seen as rudimentary formations only. * * * The contents of the bone-cells I positively believe to be a clear liquid, although in some places it looks granular. In no instance was it possible for me to see a nucleus in the cells, and their contents, as mentioned before, are perfectly homogeneous and clear." This work is illustrated by two very nicely executed plates.

Franz Boll (" *Archiv für Microskopische Anatomie*," vol. iv.; Bonn, 1868) says, "An examination of a specimen of pulp-tissue by five hundred diameters will exhibit, besides the numerous medullated nerve-fibers, an enormous quantity of very fine, peculiar, silk-like, and shining fibrillæ, which, upon the first glance, may be mistaken for very fine fibers of elastic tissue. Upon closer examination, however, they prove to be minute non-medullated nerve-fibers. The transition of the medullated into the non-medullated nerve-fibers goes on quite gradually. At first the axis-cylinder is surrounded by its comparatively thick myelin sheath, exhibiting its characteristic double contour. Soon, however, this myelin sheath decreases in thickness, and afterward is seen only in some places, where it forms the characteristic varicosities. They yet exhibit the double contour, but the very thin layer of myelin surrounding the axis-cylinder shows only a single contour. At first these intervals are small and the varicosities appear in regular succession, but soon the former become larger and the latter scarcer, until they are altogether absent. The fibers in this place are quite delicate, yet exhibit alternate expansions and constrictions in their diameters. But soon they lose this characteristic feature, and appear as naked, homogeneous axis-cylinders. As mentioned before, these nerve-fibrillæ look somewhat like fibers of elastic tissue, but their great delicacy and little resistance for reagents are proofs that they are nerves. * * * In the investigation of the terminations of these minute non-medullated nerve-fibers we meet with great obstacles. By the usual way of splitting a tooth in a vise and removing the pulp by a pair of fine tweezers, we do not obtain the whole of the pulp. The peripheral portion of the pulp forming the boundary toward the dentine is composed of a continuous layer of elongated cells, which, by long processes extending into the dentinal canaliculi, adhere to the dentine. However carefully the pulp is removed from the split tooth, we will hardly ever be able to find traces of this peculiar peripheral layer upon the pulp. The outer layer of cells, by their long processes, which extend into the dentinal canaliculi, are held firmly to the inner surface of the dentine, appearing, to the naked eye, as a thin mucus-like film. If this film is carefully scraped off with a knife and brought under the microscope, we observe that, besides the peripheral cells, it contains some of the

inner parts of the pulp-tissue. To be able to obtain the whole of the pulp untorn, I proceed in the following way: I split a fresh tooth once in a vise and place the pulp and tooth in a very weak solution of chromic acid, of the strength of one-thirty-second of one per cent. After one hour I carefully remove the loose fragments of the tooth, and then, with a thin and sharp knife, go between the pulp and the dentine close to the walls of the pulp-cavity. Thus, with a little practice and some good luck, I am often successful in obtaining the outermost portions, with the whole of the pulp in position. The peripheral processes of the outer layer of cells, which extend into the dentinal canaliculi, are generally torn off close to the body of the cells. Sometimes it happens that by the pull of the knife these fibers come out of the dentinal canaliculi in considerable length. * * * On specimens obtained in this way enormous quantities of non-medullated nerve-fibers (which by their division are greatly augmented) are seen toward the periphery of the pulp. By tearing such pulps apart with very fine needles we will hardly obtain a specimen which does not contain some of these minute nerve-fibrillæ. A very close net-work of these fibrillæ is seen on the boundary between the proper tissue of the pulp rich in vessels, and the peripheral cells, which, when removed in the ordinary way, generally adheres to the wall of the pulp-chamber. Some of these delicate nerve-fibers we see coming out of the layer below the peripheral cells, making their way between the latter, which are closely packed together, and extending above them, where they end. * * * We have now to consider the question, do the extremities of these minute free nerves extend into the dentinal canaliculi or not? I have spent a great deal of time to prove this, but have not been successful. Although I can furnish no direct proof, yet I regard the prolongation of the nerve-fibers into the dentinal canaliculi as certain. The outer surface of the peripheral portion of the pulp and the walls of the pulp-chamber are in absolute contact, so much so that there would be no room for the extremities of these protruding nerves. The direction of the ends of these nerves being parallel with the dentinal canaliculi, leaves us to think of no other way but that they, as well as the processes of the peripheral cells of the pulp have been lifted out of the dentinal canaliculi. We have, therefore, to assume two varieties of canaliculi in the dentine near the pulp: those containing the processes of the peripheral cells of the pulp, and others which receive the minute nerve-fibers emanating from between these cells."

J. H. McQuillen (Dental Cosmos, vol. x.) says, "A very valuable specimen was forwarded recently by Dr. C. B. Rising, of West Rockford, Ill., illustrative of that interesting but painful affection known

as calcification of the pulp, in which the pulp-cavity is either occupied by a number of nodules or almost obliterated by the formation of a structure which, under the microscope, presents a peculiar appearance named secondary dentine."

S. J. A. Salter ("Dental Pathology and Surgery;" New York, 1875) says, "The pulp is a soft mass which exactly fills the chamber in the fang and crown of the tooth. * * * There appear to be no lymphatics in the tooth-pulp. * * * A very pale, ill-defined areolar tissue, pervaded by numerous round and oval cells or nuclei, occupies the spaces between the vessels and nerves. The cellular bodies toward the surface are enlarged, and assume the form of columnar epithelium. From the extremities of these project minute tubular prolongations, which constitute the animal basis of the dentinal tube-wall. * * * Calcification of the pulp must be looked upon as morbid in the lowest degree, being to a great extent reparative and the result of trivial causes, though I believe it never occurs unless the tooth has been in some way the subject of injury or irritation. * * * The pathological change consists in the impregnation of the various tissues of the pulp with calcareous matter, involving more and more of the structure of the pulp, and its ultimate conversion, under favorable circumstances, into osteo-dentine. * * * The process of lime-impregnation is different from that which occurs in the formation of normal dentine and 'dentine of repair.' In these calcification is superficial, and only involves those elements which constitute the animal basis of dentine, namely, the tubular prolongations from the peripheral cells and the hyaline intertubular substance. Their calcification, moreover, is 'globular,' as already mentioned. * * * The relation of these calcified masses to the tissues among which they are found is very remarkable. The whole of the tissues, cells, nuclei, connective tissue, blood-vessels, and multitudes of nerves are swallowed up and obliterated by the calcification process."

From J. Bruck, Jr. ("Beitraege zur Histol. and Path. der Zahnpulpa;" Breslau, 1871) I copy the following: "The structure of dentinal new formations is identical with that of normal dentine, with the difference that in the former the dentinal canaliculi assume a radiating arrangement and their course is wavy. These new formations are seen not only in carious, but frequently in healthy temporary and permanent teeth. Very often these dentinal formations are met with in teeth the crowns of which have been worn by attrition, and in chronic cases of caries. * * * Calcification of the blood-vessels and nerve-fibers may occur; but I do not believe that calcified masses are found without being in connection with blood-vessels or nerve-fibers. In all my researches I have never found a

calcified mass loosely imbedded in the tissue of the pulp, but always was enabled to observe either a dentinal or an osteo-dentinal structure in it. I would therefore like to state that all formations which previously have been described as depositions of lime-salts within the pulp are nothing else than new formations of dentine. * * * It is not without interest that I have shown that dentinal tissue may be developed not only from the odontoblasts (ivory cells), but from any cell of the tissue of the pulp. Thus bone-tissue is brought one step nearer to dentine, and, as dentinal canaliculi have been found in the bone of fishes, this may throw additional light upon the subject." This pamphlet is illustrated by sixteen engravings upon two plates, which are executed in the most natural manner, and are the best on this subject that I have ever met with.

According to Waldeyer ("A Manual of Histology," by Professor S. Stricker; New York, 1872), "The external layer of the pulp is formed by a layer of large cells, of elongated form, and provided with numerous processes called 'odontoblasts,' which are arranged so as to form a kind of columnar epithelium. Three kinds of processes may be distinguished in these cells: the dentinal process, the pulp process, and the lateral processes. The dentinal processes constitute the dentinal fibers; odontoblasts with several dentinal processes are broad at the end, but as the processes pass on they gradually diminish, to form the dentinal fibers. The odontoblasts are intimately connected with one another by means of fine, short teeth, which the lateral processes of all the dentinal cells form."

From Carl Wedl ("The Pathology of the Teeth;" Philadelphia, 1872) I cite, "The outer surface of the pulp is covered with conical cells (odontoblasts), from the broad faces of which, directed outward, comparatively thick processes extend. The dentinal processes enter the continuous dentinal canals, and, like the latter, divide into branches and numerous ramifications. * * * The basis-tissue of the pulp consists of a loose connective tissue. Bundles of wavy connective tissue serve to give it firmness. In aged persons the pulp is more dense, tenacious, and contains also a larger quantity of fibrillated connective tissue. * * * A new formation of dentine, which has arisen subsequent to the abrasion of the crown, is perceptible upon the abraded surface as a central spot surrounded by polished dentine. In these cases there occurs a continued development of dentine within certain limits, determined by an irritation, and the new layers are deposited in immediate contiguity with the old, and in parts are intimately and organically united with the latter. Dentine of this description, which serves as a protecting covering of the pulp, is called 'dentine of repair,'—secondary dentine. * * * Thin cross-sections of these new formations present a

central basis-substance, composed, in many cases at least, of transparent, diskoid, homogeneous, structureless, nucleus-like masses, around which concentric layers are disposed in a manner similar to those around the Haversian canals in bone. * * * I have met with a few cases only of true new formation of osseous substance within the parenchyma of the pulp. They occurred in the pulps of milk-teeth which were undergoing resorption. * * * The greater portion of the very common osteo-dentinal formations is composed of dentine; the bony substance occurs in very small quantity, and may consist merely of a group of a few bone-corpuscles. * * * With regard to the development of these isolated encysted new formations, Heider and I have maintained the view of the occurrence of an inversion of the layer of dentinal cells, upon the following grounds: the dentinal canals pursue a centripetal course; therefore, the dentinal cells, which enter into the formation of the latter, and the development of which proceeds from the periphery of the inverted portion toward the center, must have assumed an adequate arrangement. * * * The calcareous grains are true concrements, and occur also as accessory products in connection with hard new formations, but never enter into organic union with the original dentine. They are located within the parenchyma of the pulp, and are calcifications in the connective tissue."

In the "Atlas to the Pathology of the Teeth," arranged and explained by the late Prof. Dr. M. Heider and Prof. Dr. C. Wedl, the following figures illustrate new formations in the pulp: Nos. 46, 48, 49, 51, 52, 53, 54, 55, 56, 57, 58, 60, 61, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 76, 77, 78, 80, 97.

C. S. Tomes ("Manual of Dental Anatomy;" Philadelphia, 1876) says, "The pulp may be described as being made up of a mucoid, gelatinous matrix, containing cells in abundance, which are especially numerous near to its periphery. In it some fibrous connective tissue is discoverable. * * * The odontoblast layer sometimes is called the 'membrana eboris.' They (the odontoblasts) are furnished with three sets of processes: the dentinal process (which is equivalent to the dentinal fiber); by means of lateral processes the cells communicate with those on either side of them, and, by means of their pulp processes, with cells lying more deeply. The membrana eboris covers the surface of the pulp like an epithelium. * * * No lymphatics are known to occur in the tooth-pulp. * * * The exact nature of the terminations of the nerve-fibers in the pulp is not with certainty known; the primitive fibrils often form meshes, but this does not appear to be their real termination."

Robert Baume (in "*Deutsche Vierteljahrsschrift für Zahnheilkunde*," 1874) describes new formations of dentine in human pulps,

as well as those of the ox, elephant, and hippopotamus, to which he applies the term "interstitial dentikels."

(I am sorry to state that I have not been able to obtain Dr. Baume's "Lehrbuch der Zahnheilkunde" in time for this publication.)

M. Schlenker (in "*Deutsche Vierteljahrsschrift für Zahnheilkunde*," 1875) describes two cases of new formations of dentine and bony masses in human pulps, but says little of their minute structure.

Adolph Witzel, in his work, "Die Antiseptische Behandlung der Pulpakrankheiten;" Berlin, 1879, says, "The odontoblasts at their free extremities exhibit thick prolongations, which have been torn out of the dentine; and in their finely-granular protoplasm contain one or two nuclei. * * * The new formations of dentine, considered histologically, are composed of a finely-granular or lamellated basis-substance, in which more or less dentinal canaliculi are present. The basis-substance, as will be observed in these new formations, everywhere is largely prevailing. The course of the dentinal canaliculi is very different. In some of the small globular new formations the dentinal canaliculi divide, and are distributed within the basis-substance in a radiatory arrangement. * * * The development of the free new formations of dentine is, as Heider and Wedl announce it, accomplished by an invasion of the odontoblast layer. I, according to my own observations, cannot conform with this view, but have to support the assertions of Hohl, who, with right, claims that if the loose new formations of dentine arise by an invasion of the odontoblasts, they ought to be traceable, which Hohl, as well as myself, has never been able to do. * * * The development of the free dentikels, according to my researches, is accomplished in the way, that, first, the connective-tissue corpuscles in the midst of the pulp-tissue are sprouting fine offshoots; or they proliferate and form anastomoses; the connective tissue then begins to calcify, and, as calcification (dentinification) advances, the connective-tissue corpuscle itself becomes constricted, and gradually is transformed into a dentinal canaliculus."

(To be continued.)

SOME FALLACIES OF THE BIOPLASSON THEORY—A REPLY TO DR. HEITZMANN.

BY LESTER CURTIS, M.D., CHICAGO.

In the June number of the Dental Cosmos is an article written by Dr. C. Heitzmann, of New York, on "The Minute Anatomy of the Teeth in the Light of the Bioplasson Theory." It is chiefly an explanation of his peculiar views of cell-structure. The views may

be summarized as follows: Every living organism contains in its interior "a delicate reticulum pervading the whole mass." This reticulum has no break anywhere, but is continuous throughout the whole body. It is the machine for the production of all motions, and is the only living part of the organism. There are no such things as cells. The appearances which have been called cells are only condensations of the net-work.

In the course of his article Dr. Heitzmann refers to a recent paper of mine. This paper was a review of his theory so far as relates to the red and white blood-corpuscles and the pus-corpuscle. I will recapitulate some of the chief points of the paper, in order that those who have not read it may the better appreciate Dr. Heitzmann's criticisms.

About three years ago, before I began to study the net-work, I wrote to Dr. Heitzmann and asked him the best method of seeing the structure and the kind and quality of glass necessary to show it. His recommendations were as follows:

"Take a drop of pus, fresh, without adding anything, and you will see the wonderful structure in each pus-corpuscle *with great ease.*

"Prick your skin on the palmar surface of your thumb, transport the drop on a slide, and cover right away with a thin covering-glass, the edges of which have been oiled, so as to prevent evaporation of the fluid. In the perfectly fresh blood you will see the structure in each colorless blood-corpuscle.

"Add to a drop of fresh blood a small drop of a forty per-cent. solution of bichromate of potash. This will within one hour extract the hemoglobin, and you must succeed in seeing the reticular structure in each red blood-corpuscle."

The glasses recommended for showing this structure with such ease were "a first-class $\frac{1}{10}$ immersion—such as I use—of Vèrick's, Hartnack's, Grunow's, and Tolles's manufacture." The list of names, though containing good ones, is slightly miscellaneous, and nothing is said about the need of anything more than ordinary water immersion-glasses. Indeed, some of these makers had not then, and have not yet, so far as I know, made any of the most modern homogeneous immersion objectives. Nothing is said about the need of any special appliances for illumination. It is probable, therefore, that my microscope, with a Powell & Lealand dry condenser, and especially my Powell & Lealand water immersion $\frac{1}{16}$, is fully equal to the task of seeing the structure. With these appliances I have done the most of my work on this subject, though I have also used some of the very finest homogeneous glasses, including Zeis's, Tolles's, Powell & Lealand's new formula $\frac{1}{8}$, and others.

Proceeding according to his directions, I added a forty per-cent.

solution of bichromate of potash to a drop of blood, and studied the red corpuscles. Many of them lost their color, indeed; but with this loss of color they underwent some other remarkable changes. They became reduced in diameter from one-third to one-half, and their surfaces presented so many wrinkles and distortions that they were almost unrecognizable as blood-corpuscles. I saw no net-work in them, but, even if I had seen something that looked like a net-work, I should have placed little reliance upon it as an indication of actual structure, when seen among so many unnatural appearances. I therefore turned from the red to the white corpuscles, following in my study the directions laid down by Dr. Heitzmann.

It so happened that when I began to study the white corpuscle I had been using the objective, with which I wished to study the corpuscle, in the examination of an object protected by a very thick cover. In preparing the specimen of blood I used for a cover a film of mica. The cover-adjustment had been left as it was arranged for this thick cover, and was, of course, wrong for the mica. When I had found a white corpuscle with a lower power, I put on the high power and brought the corpuscle into view. I could not refrain from an exclamation of surprise. There stood the net-work before me as plain as could be, and for an instant I thought that Dr. Heitzmann was right; but the body was blurred at the edges, and the red corpuscles in the field had a fuzzy, indistinct outline. It then occurred to me that I had not arranged the cover-adjustment. I began to turn the adjustment; as I turned, the field of view became clearer, but the net-work grew fainter. Finally, when the field came out bright and clear, and the outlines of the red corpuscles were well defined and sharp, the net-work was gone. In place of it the corpuscle was covered with little rounded eminences, varying in size and in distance from one another.

These eminences were always seen when the cover-adjustment was right. I had in my possession for some time a very fine homogeneous immersion $\frac{1}{8}$ made by Gundlach. This glass had no cover-adjustment; it always showed the eminences, and never the net-work. The eminences appear to be minute granules, of which the corpuscle is composed. They are seen with great distinctness in the large granular white corpuscles that are so abundant in anæmic persons. Women after prolonged lactation are excellent subjects in which to study them. In some of these cases the nodules are so distinct as to strikingly remind one of the zooglœa masses of bacteria spores that one may see at any time in urine beginning to decompose. In some cases the granules are scarcely less distinct than in the zooglœa mass. I have often seen the vacuoles, which so frequently form in the corpuscles, come so near the edge as to leave only one row of

granules between the vacuoles and the edge of the corpuscle. Sometimes this thin rim breaks and leaves the granules projecting in a point. I have even seen some of the granules become detached and float away from the corpuscle. In some instances the granules leave the body in great numbers, and a shadowy, ghost-like structure remains, with here and there a granule sticking to it.

By keeping the slide with the blood upon it for ten or twelve hours, taking care that the edge of the cover is well oiled, the corpuscles change in appearance. The granules may then be seen to have a swarming motion, resembling that of a collection of bees.

Pus-corpuscles resemble the white blood-corpuscles very closely. The corpuscles from an ordinary abscess resemble the white blood-corpuscle that has been kept for some hours. In pus-corpuscles the swarming motion of the granules is often very distinct. I have watched one particular granule in one of these bodies, and seen it move more than half-way across the corpuscle before escaping from view. Occasionally I have seen pus-corpuscles in part of which the swarming motion could be seen, while it was absent in the other portions.

These granules within the corpuscles are of a size large enough to be easily measured under a power of from twelve to fifteen hundred diameters. They are also of an appreciable height, as can be seen under a sufficiently high power by gently changing the focus with the fine adjustment, and also by changing the direction of the illuminating-pencil, as can readily be done with the achromatic condenser.

My paper was illustrated with drawings. Part of these were made by myself from nature; the others were careful copies of drawings illustrating the net-work made by Dr. Heitzmann or his friends.

All my own drawings were compared with the objects themselves by persons familiar with microscopic observation, and were pronounced reasonably good likenesses. Drawings like these were sent to Dr. Heitzmann for his opinion. He criticised them in a letter to me in the following words: "You draw everything in and out of focus; you should draw only what is clear and sharp in ONE focus." Who will dare determine in every case just what is in focus and what is out of focus, and then venture to decide what to leave out of the drawing and what to put in? If Dr. Heitzmann's words mean anything at all, they mean, "You should draw not what you really see, but what you think you ought to see."

I hope he is better able to reconcile this method with old-fashioned honesty than I am. I insist that the only proper and honest way to draw is to draw everything exactly as you see it, without any change at all, and that is what I have tried to do in my figures.

The first of the illustrations of the net-work was made by Dr.

Klein, of London. It is commended in Dr. Heitzmann's article, and was referred to by him in a letter to me in the following words: "He draws the net-work *even nicer than it really appears.*" This disposes of the drawing as a representation of what was actually seen, and shows that it was constructed on Dr. Heitzmann's plan. The other drawings were made by Dr. Heitzmann himself.

My paper also contained arguments the bearing of which Dr. Heitzmann's imperfect knowledge of English may have prevented his perceiving. He, however, should know the details of a controversy upon the interpretation of the appearances seen upon some delicate silicious shells, which are used as tests for the microscope. One of these, called *pleurosigma angulatum*, was formerly described and figured as being covered with a honey-comb of cup-shaped figures, whose sides, united to each other, formed ribs, which ran across the surface of the shell. This was explained as a beautiful plan of nature to economize material and combine strength with lightness. But after a while glasses were improved, and the accuracy of this description was doubted. Then it was proved that, instead of being covered with ridges, the shell was really composed of little beads joined together so as to form a plate. The beads result from the peculiar manner in which silex is deposited from certain solutions; similar beads can be formed artificially. The hexagons, then, were the imperfectly-seen interspaces between the beads.

It is now a recognized fact that a series of circles placed close together will give rise to an optical illusion, and produce the appearance of hexagons bounded by straight lines. If these circles are of equal size and at uniform distances the hexagons will be regular, but if they are of irregular size and at unequal distances the hexagons will be more or less distorted. We can, of course, distinguish the true shape of the figures if they are large enough and are placed in a good light near the eye; then they will appear distinct and perfectly round. But if they are removed to a little distance, especially if the light is dim, the illusion is so complete as to be almost irresistible, even when we know the shape of the figures. Any one may try this experiment for himself by drawing a series of circles and filling in the outlines with black.

The similarity of these hexagons to Dr. Heitzmann's figures is very striking. It would be of interest to know his explanation ot the resemblance.

Most of us who have tried to push microscopic investigation are painfully aware that there is a limit of visibility beyond which we cannot go. The most difficult natural object which is used as a test of the quality of the microscope is another silicious shell called *amphipleura pellucida*. This shell is marked with lines $\frac{1}{90000}$ of an inch apart.

When it was shown that these lines had wavy edges, which gave them an appearance somewhat like that of a rope, one of the most difficult of feats was thought to have been accomplished. From this appearance and the analogy of other similar structures it was inferred that the lines were rows of beads. Beads, then, $\frac{1}{90000}$ of an inch in diameter, are almost beyond the border of microscopic visibility, and are only to be seen with the very best of modern homogeneous immersion-glasses, used with other modern accessories. But very few have been able to see them, even with these appliances.

Now, to return to Dr. Heitzmann's drawings. They represent the net-work at rest, actively dilated, and actively contracted. In the one representing the corpuscle at rest the meshes of the net-work inclose spaces which average rather more than half an inch across. The white corpuscle in Dr. Klein's drawing is magnified not far from two thousand diameters. The meshes in Dr. Heitzmann's drawings are not less than five or ten times as large as in Dr. Klein's. If we may judge from these facts, then, Dr. Heitzmann's figures represent objects magnified *ten or twenty thousand diameters!* Let us look at these figures a little.

The nodal points at the intersection of the lines are largest in the drawing which represents the net-work as contracted. In this drawing the nodes are about one-fourth of an inch across. If we suppose the figure to be magnified twenty thousand diameters, the real size of the bodies would be $\frac{1}{80000}$ of an inch. But, not to press matters, say it is magnified only ten thousand diameters. This would give the bodies a size of $\frac{1}{40000}$ of an inch. Such a body might be seen without excessive difficulty with a good high-power glass. There are, however, some other difficulties that we may consider.

An ordinary white blood-corpuscle rarely, if ever, exceeds $\frac{1}{2000}$ of an inch in diameter. If these figures represent portions of such a corpuscle, then twenty of the nodules placed in a row would extend across the corpuscle, not counting the interspaces. But the interspaces, even in this figure, are about as large as the nodes. Turning to Dr. Klein's drawing, we see that between twenty and thirty nodes are found in the diameter of the body. Twenty nodes of $\frac{1}{40000}$ of an inch and twenty interspaces of the same size would be somewhat crowded in a space of $\frac{1}{2000}$ of an inch.

In the drawing showing the net-work in a relaxed condition, the nodal points are only one-sixteenth of án inch across. Here we are in a much better condition as regards room, but there arises another serious difficulty. If we still suppose that our corpuscle is magnified only ten thousand times, we shall have here a body $\frac{1}{160000}$ of an inch across, about one and three-fourth times smaller than those beads of *amphipleura pellucida*, which are so small as never to have been clearly seen.

Again, the widest of the lines which connect these nodes are less than the thirty-second of an inch across, and the narrowest much less than this. Does he really expect us to believe that he, or any one else, can see lines less than $\frac{1}{320000}$ of an inch across, and lines, too, exceedingly pale, and imbedded in a mass of tissue like them in color and appearance?

I might continue this subject further, and call attention to some investigations of Professor Abbe, of Jena, on the ultimate visibility of objects. which would afford food for reflection in this connection; but I will leave the point.

Such are some of my observations and reflections on this subject. While engaged in the study I have communicated, personally or by letter, with a large number of microscopists, several of whom have earned more than a national reputation. Some were kind enough to go over the ground together with me and by themselves. Every one of them, without exception, who did so agrees with me. Some have expressed themselves quite strongly on the point, and I have never succeeded in finding an experienced microscopist who believes the theory.

My paper was read at the last meeting of the American Society of Microscopists. There were present a number of life-long microscopists, some of them men of eminence. The paper was received by them with marked favor. and without one dissenting voice, so far as I know.

In spite of this support which the subject has received, the following is all that Dr. Heitzmann has to say about it:

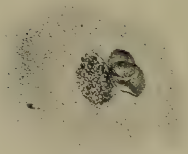
"Lately Dr. Lester Curtis published an article on this subject, and stated that he could not see the reticulum. This is a very modest way to announce that one cannot see what another can. If a person publicly confesses that he cannot play on the piano a master-piece of Liszt's, we are all willing to believe it; but does it follow that others cannot play the piece either? What is gained by such a confession? Dr. Curtis gives illustrations of what Elsberg and I have said and seen, and of what he could *not* see. I mention this because you are all prepared to understand that delicate observations of this nature are not easily made by every one. A great many look in the microscope, but very few can *see*. If one of you who had never played the violin were handed a good violin and told to play a tune, he would say, 'I can't.' Let him practice for a few years, and learn to play a tune. It is very much the same with the microscope. If you look in for but a short time, you cannot see. It required more than fifteen years' application to enable me to see what can readily be seen, and if a tyro comes and declares that he cannot see, I do not think such assertions should be taken as proofs against facts corroborated by others."

I submit to the judgment of all fair-minded readers whether such a rejoinder is in any sense an answer to my arguments. And I insist that until they are answered I have sufficient ground for holding

PLATE VI.

Fig. 1.

Fig. 2.

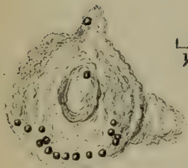


1/1000 inch × 582

Fig. 3.

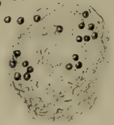
1/1000 of an inch × 1050.

Fig. 4.



1/1000 of an inch × 1050.

Fig. 5.



1/1000 of an inch × 1050.

Fig. 6.

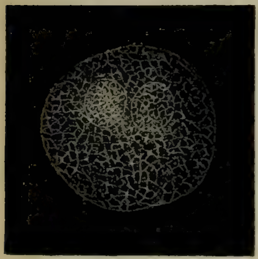


Fig. 7.

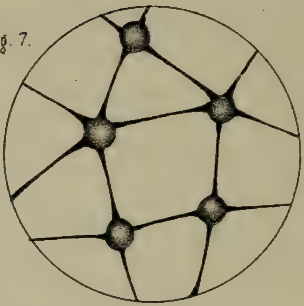


Fig. 8.

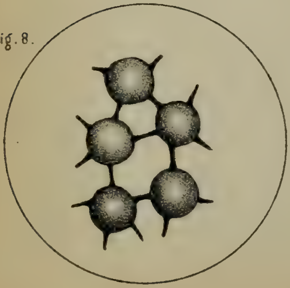
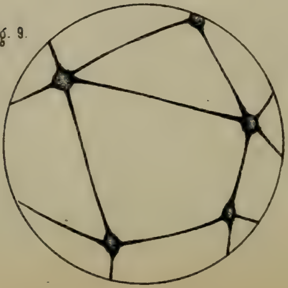


Fig. 9.



that this net-work is merely the misinterpreted interspace between the granules, and that it is one more example of the many optical illusions which, from before Ehrenberg's day up to the present time, have so often led astray even good observers.

The plate herewith accompanied the paper referred to in the text. Figs. 1 to 5 were drawn by myself.

Explanation of the Plate.

Fig. 1. An ordinary white blood-corpuscle with one red corpuscle.

Fig. 2. An ordinary white blood-corpuscle from another person, and two red corpuscles lying one over the other.

Fig. 3. Granular white corpuscle from Mr. Griscom; granules beginning to leave the body.

Figs. 4 and 5. Granular corpuscles from Mr. Griscom, discharging their granules.

Fig. 6. A white blood-corpuscle, referred to by Dr. Heitzmann; from Klein's "Atlas of Histology."

Figs. 7, 8, and 9. Representation of the net-work from "The Structure and other Characteristics of Colored Blood-Corpuscles," by Louis Elsberg, page 46; referred to by Dr. Heitzmann. Fig. 7 represents the net-work at rest; Fig. 8, in extreme contraction; Fig. 9, in extreme extension.

IN THE NATURE OF A SUR-REBUTTAL.

BY WM. BARKER, D.D.S., PROVIDENCE, R. I.

The passage by two States during the past winter of bills regulating the practice of dentistry, and the veto by Governor Long, of Massachusetts, of such a bill, afford an opportunity to say something more on a subject which we are persuaded has not yet been fully exhausted.

Our article in the October (1881) Dental Cosmos, which was replied to by Dr. W. P. Church in the December number of the same magazine, and also by "B.," in *Johnston's Dental Miscellany* for November, are the only contributions to the discussion of this subject that have come to our notice. There is abundant evidence that the subject has a strong and general interest for the profession; nor is evidence wanting that it is a subject in which the general public are becoming interested. That the difference between the advocates and opponents of dental legislation is fundamental, and possibly irreconcilable, is abundantly shown by a careful perusal of the three articles above referred to. So far as the readers of the Dental Cosmos are concerned, we think we may safely assume that the article by Dr. Church is considered a sufficient "reply" to our article, inasmuch

as he alone among the vastly preponderating numbers of the advocates of dental legislation has attempted anything like a studied answer to it. It is more than probable, however, that Dr. Church would disclaim any purpose of speaking other than for himself and the Rhode Island Dental Society. We certainly assume to speak for no one but ourself. We desire as briefly as may be to analyze such portions of Dr. Church's paper as seem to call for it. We cannot do better than to begin at the beginning, or with the very caption, of his article, "Liberty Without Law is License." The idea intended to be conveyed by the phrase is evidently this: License is an evil; "liberty without law" is identical with license; therefore, liberty is an evil. Liberty and license are base metals, and only as they are alloyed by the noble metal, law, are they safe to handle; safety in handling them bears a direct ratio to the amount of alloy they carry. It will be seen that it is only another way of saying that liberty is an evil, and, as such, the more we have of it the worse we are off, and the less we have the better off, and that law being a good the more we have of it the better, and, conversely, the less law the more evil. We think a careful reading of our own and Dr. Church's articles will show that, as between us at least, the issue is squarely joined. We are for the utmost possible liberty with the least possible law, he for the utmost possible law with the least possible liberty. Yet he says, "To love liberty is as natural as to love life." It is born in us, "a spontaneous impulse." This is surely very sad, in view of what follows in the same paragraph: "Man from his nature and condition must serve. There must be a dominant power." Whom he is to serve, and from whom he who exercises "a dominant power" receives his authority, he does not tell us directly. We are left to infer, however, from the general tenor of his article, that the "dominant power" would be represented in the laws regulating dentistry, which he desires, and the servants in the dentists. We were gratified, however, in the next paragraph to read that "moral law is the foundation of society. Society cannot exist without the acknowledgment of some such law, and without an attempt, however confused and inadequate, to carry that law into effect." We believe that doctrine sound. That laws regulating the practice of dentistry violated that moral law was what we attempted to prove in our article. It is somewhat confusing to read in the same paragraph, "Thus it will be seen that our whole fabric of civilization depends upon law and government for its support. Is this an evil necessity? If any one wishes to know on which side the evil lies, take away the law for a single instant in the commercial world. Let men forget justice, honesty, and truth, and witness the confusion and panic which ensues!"

Since when "justice, honesty, and truth" have been synonyms for human law we are not told. Certain it is that not only now, but in past times, very many of the human laws that cumbered our statute-books have been utterly useless. It is likewise certain that many of these laws have retarded progress and done violence to "justice, honesty, and truth;" while those three virtues, lived up to, are sufficient now, as they always have been, to harmonize society and establish order. We fear Dr. Church loses sight of the fact that "justice, honesty, and truth" are the essentials, while human laws are the non-essentials. He has learned to reverence the symbols, while neglecting somewhat the claims of the reality; he has mistaken the shadow for the substance.

The next paragraph contains information which certainly is important if true, and must be comforting to law-makers and autocrats generally. Hear it! "Human law is also divine law, for law is not a thing made by man, but gradually discovered by him. It was all in the plan at the creation, and has been little by little adopted by man as he progressed in civilization and morality. Shall we have more government? We shall have more and more as we find or attain more and more good and true laws which are to be enforced." It is perhaps unnecessary to say that if human laws *are* also divine laws, we must either modify our ideas of divine "justice, honesty, and truth," or wish for a reign of law that at least will meet the demands of fair play and equity, even though it contain no divine element. It is the old doctrine of the divine right of kings and the authority of the Church in things temporal polished up and brought forward to do service for class legislation, but alluringly labeled, "For the benefit of the people." The trouble with Dr. Church seems to be that he does not clearly recognize the essential difference between so-called divine or natural laws, which are immutable, and in harmony with which we *must* range ourselves to attain perfection and happiness, and human laws, which are at best but artificial makeshifts or expedients, and which change with every shifting wind of majorities. It is because we believe dental legislation violated or was out of harmony with the law of equal freedom—which seems to us to be a natural law—that we opposed it, as a move in the wrong direction and not demanded by circumstances. Dr. Church, however, seems not to believe in the law of equal rights or equal freedom, whereby it follows that he *must* believe either that some people have no rights at all, or that there is a privileged class enjoying more rights than their fellows. We can only confess to amusement when we read the paragraph in which he refers to what we called the first principle, viz., "Every man has freedom to do all that he wills, provided he infringes not the equal freedom of any

other man." He claims that "this first principle is an absurdity not possible of application, and consequently contains no principle." Dr. Church is also "led to inquire by what right one man can originate an axiom, and a moral axiom at that." To say nothing of the very apparent right which any person has to originate or discover as many axioms as he may choose to or can, as well as dental instruments or anything else you choose, the right to so originate would at least seem to rest on as good grounds as his right to "gradually discover divine law." It is left for one who advocates the right of a mere majority to say who may and who may not exercise a chosen vocation to question the right of one man to originate an axiom—and a "moral axiom" at that. To originate an immoral axiom, we infer, would not be so atrocious. Dr. Church complains that we use the words *trade* and *profession* as synonymous, and says that "they differ in the very essentials which are necessary for their joint application in the case." We ought perhaps to apologize for thus wounding his tender sensibilities. He admits that "we regard every legitimate occupation as honorable,—some are more honorable than others,—and those more honorable occupations are professions." We can only see in all this, in the first place, a hyper-sensitiveness born of a feeling of insecurity or untenableness in the "more honorable position" which he arrogates to himself, and, secondly, a total lack of appreciation of the fact that upon a question of abstract right, upon which plane we attempt to discuss this question, and where we think it belongs, matters of rank, and "more or less honorable," have no place. The reply made to the apology of a poor woman who found herself kneeling beside the Duke of Wellington at the altar, that "in the presence of God there is no such thing as rank," may be applied here. In the vocabulary of right there are no such undemocratic words as *rank* or *caste*.

Dr. Church says, "The trader may exhibit his wares for the inspection of his patrons; with the professional man there is no such opportunity. The patrons of the professional are forced to rely upon his qualifications for the profession, and upon his honor." He puts forward this argument with a confidence which is seemingly the outgrowth of a conviction that it is unanswerable.

The mere fact that goods may be seen and handled is not, as we all know, a sufficient test of their genuineness or quality. To use a common phrase, "The test of a pudding is in the eating." Satisfaction to patients is the best test of ability in the long run. The diploma does not make the dentist; diploma or no diploma, people sooner or later find out the difference between the good dentist and the bad one, and starve the latter out. To say that the purchaser

of professional services has no opportunity of knowing what quality of services come from any particular office is to say that a dentist's reputation for honor and ability are worth nothing, that there is, indeed, no relation between reputation, honor, and ability. Honor and skill are well-known and understood qualities as well as quantities in estimating the comparative merits of different dentists; nor can honor or good intention take the place of ability. Dentists understand this as well as the public, and it is a sufficient incentive to many to be skillful and honest, because it pays. One may readily realize the tangibility, so to speak, of professional honor and ability by undertaking either to purchase or sell a dental practice. So, then, although a purchaser of professional service has not the opportunity to handle the goods, and, like the purchaser of bundled articles, must to some extent rely on the honor of the dealer, yet the fact that the professional pudding has been used by neighbor and friend, and that the professional man has a well-established reputation for serving a viand that does not produce epigastric disturbances, gives the purchaser reasonable assurance that he will get, what he may reasonably expect, conscientious and skillful service; more he could not ask. The public is not an infant, and need not be treated as such. It well understands, Shakspeare to the contrary notwithstanding, that reputation is *not* an idle word, and that the value of an article or service bears a close relation to the price demanded for it.

The key-note of Dr. Church's article, and, indeed, of this whole movement for dental legislation, is struck when he says, "The necessity for proper qualification and sense of honorable duty in the professional man makes it specially apt that the law should afford protection to the educated and honorable practitioner, * * * and, more than all else, protecting the public from extortion and imposition." We believe these two considerations are given the order which their respective importance assumes in the mind of the writer, and those whom he represents. Notwithstanding the "and more than all else," we cannot resist the conviction that the "true inwardness" of this movement is a supposed self-protection, or self-interest. For our own part, and we believe in this at least we represent the feelings of many honorable practitioners, we do not seek or desire protection; nor do we believe the public need protection from us, especially in the absence of any demand for it on their part. "The educated, honorable practitioner" can protect himself. Education, honor, and skill, though not in such demand as we could wish, are yet more valued and appreciated than empiricism and quackery. We have no faith in the final triumph of error over truth. Ultimately knavery, ignorance, and incompetency must go to the bottom; they gravitate downwards, not upwards.

"Truth crushed to earth shall rise again;
The eternal years of God are hers,
But error, wounded, writhes in pain
And dies amid his worshippers."

If the honorable, carefully-educated, and skillful practitioner cannot successfully compete with the quack and the charlatan, it argues less skill on the part of the one or more on the part of the other than is generally supposed, or both. Quackery flourishes on the weakness of the so-called "regulars" and the ignorance of the public, it is true; but there is no way of abolishing it until there is some invention to prevent mankind from making fools of themselves; and even the wise are apt to take refuge in empiricism when regular science is hopeless. If the finger of experience does not indicate to the public with sufficient clearness whether their true interests lie in the direction of the skillful or the unskillful, the educated or the ignorant practitioner, it is hopeless to suppose they can read the finger-post planted by legislation for their guidance. If the people find no lessons in experience and learn nothing from observation, then, indeed, is their case hopeless. "If to be ignorant were as safe as to be wise, no one would become wise." Dr. Church tells us, "The State assumes the right to say who shall practice law." It is the business of the State, in its function of protector, to administer law and run, so to speak, the machinery of government. This being the case, it has an undoubted right to insist that whoever desires to *practice before the courts*, or use the machinery of courts of law, shall understand the machinery. Any man may give legal advice and do as much law-business outside the courts as he pleases. The argument amounts to this, that because it is the business of the State to administer law and pronounce upon the qualification of lawyers who practice in law-courts, therefore it is the business of the government to administer medicine or dentistry and pronounce upon the qualifications of its practitioners. Consistently, the argument involves just that. To say that because the State does assume to direct many of the affairs of life, therefore it should go on enlarging the list, is not to the point.

It was amply shown in our paper and admitted by Dr. Church, and, indeed, is matter of common knowledge, that the unwisdom of governmental meddling in many affairs had been proved over and over again. The question is, whether the government should try any more experiments in the same line. Dr. Church and those who think as he does say "yes." We say "no," and we base our negative, first, on abstract considerations of equity, and, secondly, on considerations of expediency, which, after all, will be the only considerations which will have much weight with a large class of minds. We believe

that any given course being proved to be wrong and in violation of natural rights, it necessarily follows that it is inexpedient. But the questions, How will it work? Will it pay? and the answers thereto will decide many minds as to the adoption of any given course, where abstract considerations fail to. And here we need only ask whether, in those States where dentistry enjoys the protection of special legislation, it is on any higher plane and holds within its ranks less poorly qualified practitioners than those States which do not enjoy such protection? We can only say, from such information as we can gain, that the question must be answered by an emphatic negative. Every dentist knows that in some of those States which have special legislation on the subject the worst hot-beds of quackery and empiricism exist, while in some States without special legislation the status of dentistry is fully abreast of that of any other State. The advocates of dental legislation tacitly or impliedly, if not directly, assume that a person cannot properly qualify himself for the practice of dentistry outside the colleges. We believe, however, that with the excellent text-books, the abundant and exhaustive dental periodical literature which are within the reach of anybody, coupled with a proper and conscientious instruction in a private office enjoying a good practice, it is quite possible for any earnest and intelligent person to so qualify himself for the practice of dentistry that his patients shall have certainly no more cause to complain than will the patients of by far too many men who write D.D.S. or D.M.D. after their names. This is saying nothing against the colleges. It is simply saying that to be treated justly a man must be judged by his qualifications without regard to where or how he gained them, and that a man possessing, or believing himself to possess, the necessary qualifications, certainly should not be prevented from rendering service to any one who may see fit to employ him. That there are many men in the ranks of the profession reflecting credit upon it who are not graduates is well known. It is also equally well known that the colleges furnish numerous recruits for the ranks of the quacks and charlatans. Of course, this is not the fault of the college, but of the man. We should therefore judge and allow the public to judge each man according to his deeds, whether they be good or whether they be evil. "Let every one and all things stand upon their own inherent merit." Let no one accuse us of undervaluing the colleges. We most assuredly believe, other things being equal, that the man who has had the advantages of instruction in a reputable dental college, as against one who has not, will be best prepared to serve his patients. The public generally also believe it, and it is because demand will control the supply, because an enlightened self-interest *will* guide men to the colleges, that we believe it entirely safe to let the matter regulate itself.

This whole move for dental legislation, having as it has its inception among and its support almost entirely from the dentists, is a marked symptom of that itch for recognition which for a number of years has been almost epidemic in the profession. The addresses at our societies and our periodical literature contain many a nauseating whine and complaint that the medical fraternity do not accord us that recognition which the fact that "dental surgery is a specialty in medical science"—to quote from the "Code of Ethics—"entitles us to. The question as to whether dentistry, as now practiced, *is* a specialty in medical science, to say the least, we consider an open one. Leaving that aside, however, we may safely say that the medical profession will as cheerfully extend to us the right hand of fellowship as it now does to those who practice otology, gynecology, ophthalmology, etc., when we shall fit ourselves for our specialty as they do. In the meantime we submit that the only way for a profession to receive respect or recognition is the way an individual must, namely, by *commanding* it, not *demanding* it.

In the long run a profession, like an individual, will find its level. The way to elevate the profession is to elevate the individual. The fountain cannot rise higher than its source. Those members of our profession who are *really* entitled to the recognition demanded for all receive it, for the most part, we doubt not, without the asking. We stated our belief that he who graduated from a dental school, other things being equal, would prove a superior dentist to him who did not. We also believe that he who will add to the instruction of a dental school that of a medical school, other things being equal, will prove the superior of both. We cannot but feel that a movement which seeks to force the profession into a strained position is doing us questionable service. Well-ripened fruit needs not to be clubbed from the tree. A matured profession falls naturally into that position which its merits entitle it to. Factitious aid can only retard its progress. We submit that this whole question is one which dentists can afford to treat fairly. We do not believe, with Dr. Church, that "as a matter of fact, reason alone has never and never will govern the world." Part of the statement is true, doubtless; part we believe untrue. Enlightened human reason we believe to be man's best guide, and that an honest and earnest attempt to get to the bottom of this question should not be met by covert sneers at "the self-styled free-thinking social scientist." He who does not believe in "the reign of reason" must believe in the reign of unreason. He who does not believe in the efficacy of reason and argument to settle disputed questions naturally resorts to innuendo and appeals to passion and prejudice. The demand for dental legislation is at present popular. That the working of the law will disappoint its advocates,

we have no doubt. Because those who oppose dental legislation do not ask protection for themselves, nor believe the public need or demand protection against them, let no one advocating such legislation waste his ammunition in volleys at straw men of his own setting-up.

The moral sense of the opposers as well as the advocates of dental legislation "condemns the scoundrel who would impose on his helpless fellow-men." Let no one who has *reasons* to advance in favor of dental legislation use the "I am holier than thou" argument against an opposer of it who believes, as a matter of fact, in the law of the "survival of the fittest," by saying, "Such an idea we hold to be a grave evil, especially when voiced by a member of the healing art." We all profess to be actuated by the same motives,—the well-being of the race as a whole. We differ only as to methods. We believe in the utmost possible play of natural laws, and that the interference of the State is only justified when clearly understood rights are interfered with, or where a practically unanimous consent or demand calls upon the State to do what from its position it can best do, such as light-house service, post-office, coinage, harbor quarantine, etc. The need should be *general*, and also the *demand*. Wisdom should be encouraged and ignorance discouraged by all proper methods. The unwisdom of making ignorance safe, of doing away with the teachings of experience, may well be questioned. The parent deals with the children; the government with men and citizens. A citizen's first duty is to care for himself, and not to get taken care of. To this end he must learn by experience; if he would survive he must be a man, and not a child.

EXTENSIVE AND DIFFICULT OPERATIONS.

BY MARSHALL H. WEBB, D.D.S., LANCASTER, PA.

Among the cases presented at the clinic given under the auspices of the First District Dental Society of New York, in April, 1881, was one where it had been said to be impossible to apply the rubber dam to the remaining part of a molar tooth. The buccal wall alone was standing, and the fracture extended three-sixteenths of an inch above the margin of the gum and up alongside the palatal root; and, in order to get a clamp and the rubber dam on this part of the tooth, the gum had to be pressed away some distance with gutta-percha. In operating upon this case at that clinic, the writer demonstrated what can be done in overcoming difficulties in applying the rubber dam for the performance of extensive and difficult operations with gold.

The crown, as prepared for the restoration of its contour with gold, is here illustrated (Fig. 1), the buccal wall having been cut off an

eighth of an inch (see Fig. 2), to be covered and bound in with foil. A gold wire was fitted in the palatal root, and another in one of the buccal roots (Fig. 1). They were soldered together, and a hook

FIG. 1.

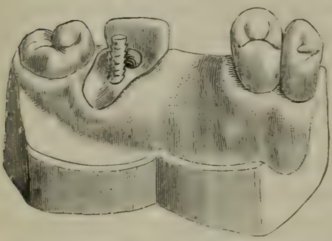
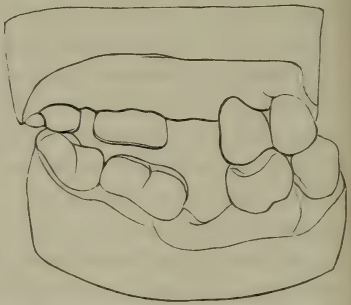


FIG. 2.

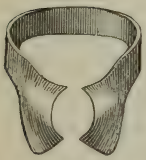


was made on one part of the wire (Fig. 3), which was carefully fitted to a depression cut to correspond with it in the dentine of the palatal root, along one side of the somewhat enlarged pulp-chamber. When the wire was put in place, the hook was pressed toward the depression, so that, in order to come away, it would have to bring with it nearly all the dentine between the depression and the surface of the root. The other wire was barbed, and, though it did not fit very tightly before this was done, the use of a hand-mallet was necessary to put it in position. The apical foramen of each root was closed with narrow strips of light gold foil. After this preliminary work had been done, and when the larger part of the operation was to be performed, a Delos Palmer clamp, "R. S., 8" (Fig. 4), was placed on the third molar, and a Tees "festooned" clamp (Fig. 5) on the remaining part of the second molar. The rubber dam was then stretched over both clamps and put on the second bicuspid, the rubber bridging over the space left by the loss of the first molar. The clamps and rubber dam were applied in about three minutes.

FIG. 3.

FIG. 4.

FIG. 5.



After the clamps and rubber dam had been applied and the parts had dried, and the final preparation had been made, oxychloride of zinc was placed in each root, and, while the cement was yet plastic, the two united wires were driven to the place to which they had been fitted (Fig. 1). When the cement had hardened sufficiently, it was cut away from all parts where foil could be placed advantageously and made to strengthen the operation. The contour of the entire crown was then fully restored with gold. This operation took one hundred and fifty grains, or two and a half books, of gold—cohesive foil,

Nos. 30 and (principally) 60. With the assistance of friends, who annealed and placed each piece of the foil in the cavity ready for packing, it was all made compact, and the crown and cusps were restored and put in proper shape with the electro-magnetic mallet, in four hours.

This operation was performed without inciting pericementitis, although the pressure of the clamp, which was kept in place so long and held so far up upon the tooth, brought about some inflammation of the pericementum and the gum surrounding the neck of the tooth; but this soon passed away. The patient, Dr. G. S. Meigs, of New York, said, however, that "when the operation was commenced the palatal root was a little sensitive; but even then any one with a little endurance could stand the mallet if he only thought he could."

Attaching Crowns to Single instead of Two Teeth where Roots are Missing.

The first report given of the attachment of a crown to natural teeth, without a plate or clasp, appeared in the Dental Cosmos for October, 1869. In this article it was stated that Dr. B. J. Bing, of Paris, had inserted several crowns in this manner, some of which had then been in place nearly a year. Dr. Bing backs a porcelain crown with 18-karat gold plate, and to this (and for the insertion of crowns between central and lateral incisors) he usually solders a gold wire, each end of which he builds with gold into a cavity newly made, or one that is decayed and prepared, in the palatal portion of the enamel of each of the two teeth adjoining; in some cases extending and building a small part of gold plate or wire into a cavity in each approximal surface next to the space to be filled.

While in Paris during August, 1881, and while visiting Dr. Bing, he called the writer's attention not only to several cases where he had attached artificial crowns to two adjoining teeth where roots were missing, but also to other cases where a crown was fastened to one tooth alone. All the crowns were firmly set and still serving the purpose intended. The method, modified and followed by the writer since performing his first operation (February, 1873), is quite different from the mode adopted in inserting the first crown, which was prepared somewhat according to Dr. Bing's plan, and, though the work is more difficult, yet the improved crown is stronger and more complete, cleanly, and beautiful than when gold plate is simply riveted and soldered to the porcelain. It was to avoid such an accident as the breaking of the porcelain from the pins that the writer modified the method of preparing and inserting crowns. Among the changes made were those of making a groove (though not cutting it too deeply) in each side and along the cutting-edge of the porcelain, and placing gold foil solidly in the groove and slightly over the

cutting-edge, to make the porcelain more secure than when the platinum pins alone hold it, and to protect the edge from the occlusion of the lower teeth; also, to build the crown into the approximal surfaces only. After the wire has been fitted to the adjoining tooth or teeth, or properly placed in a root, and a heavy but rather narrow backing of gold plate has been riveted to the porcelain, and the parts are fixed together and soldered, the greater part of the preparation of a crown which remains to be made, and the whole of the building of gold foil about it, is done out of the mouth at whatever time may best suit the operator; but the work requires care, and must be skillfully and well done. A starting-point should be made either between the gold backing and porcelain or between this and the wire, and the latter must be firmly fixed in a hand-vise while the gold foil is being put in place and made compact with the electro-magnetic mallet. All crowns should be prepared and finished in the manner described, with such change or additional work as is necessary to place them on roots, or to attach them to single or to the two adjoining teeth where roots are missing.

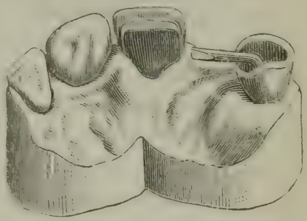
Methods have been devised or adopted with the object of lessening the time necessary to perform such operations and making them easy and cheap by the use of amalgam or some other plastic material; but sufficient time must be taken, excellent judgment and ability are required, and the use of gold is necessary for the doing of really fine, beautiful, and permanent work.

When a crown is to be attached to one tooth alone, the operation is not likely to be successful (excepting where a bicuspid crown is built into a molar tooth) unless the tooth which is to support the crown be a pulpless one, and then such an operation can be made both durable and beautiful. To secure sufficient anchorage for the insertion of a crown in such a manner, therefore, it may sometimes be necessary to destroy a pulp; but this ought to be the last resort, and should be done only when calcification of the enamel and dentine is complete or apparently so. The end, if well attained, justifies the destruction of a pulp for the insertion of a crown mainly because of the beneficial results which follow. These are the longer preservation of the remaining teeth, the gums, and the alveolar process in normal condition, or the prevention of the absorption of the hard as well as the soft tissues under, and because of the pressure of, plates,—this loosening and loss of teeth sometimes occurring years before there is likely to be such solution of the lime-salts of the maxillary border and recession of the gum.

Where a crown is to be built into one tooth only, a gold wire, no lighter than No. 12, should be used. It should be fitted as far up

the root as it is safe to enlarge the pulp-chamber for it; but the drilling may properly be done only after every part of the pulp has been removed and the apical foramen has been carefully closed with small, narrow pieces of light gold foil, which must not be put in place so long as there is any irritation about the end of the root.

Fig. 6.



In the case here illustrated (Fig. 6) the wire is fitted in the root and bent to receive the crown, and the cavity is nearly prepared for the filling-in of gold. The cuspid (as well as the other teeth remaining in the mouth) became so abraded as to expose the dentine, so that the margins of enamel had to be prepared for the placing of gold over them, and, when the crown was built in place, they were carefully covered with, and are thus protected by, the solid metal. After the porcelain part of the crown of the lateral incisor had been fitted to the model and soldered to the wire (shown in Fig. 6),—this portion of the wire should be flattened somewhat in some cases), the groove was made around the porcelain; the foil was solidly built in place, and finished in the manner hereinbefore described, and the crown was then inserted and the contour of the cuspid tooth was restored with gold. (The root of the left central incisor remains, and the crown which is fitted upon it is prepared for the building on of gold foil; after which it will be ready for insertion.* When this crown is put in place, the gold wire is to be surrounded with gutta-percha; but little of which is or should be needed in the pulp-chamber, because of the close fitting of the wire in and of the crown upon the root. During this preparation, a plain "pivot" crown is kept upon the root, held by wood and gutta-percha.)

When the lateral incisor crown, in the case illustrated, was ready for insertion, and the gold at the base, which was to rest upon the gum, had been nicely fitted to it, and the whole of the gold was smoothly finished, a good-sized piece of light-medium rubber dam was applied to the teeth (the cuspid and the central and lateral incisors) on each side of the space to be filled, and so arranged as to cover the gum and the root between these teeth. The crown was made to so rest upon the gum as to press the blood from the capillaries of the part, and thus prevent particles of food from getting under it. (While the thickness of the rubber dam might, to some slight extent, prevent the placing of such a crown against the gum as firmly as it should be pressed, yet this thickness is compensated for by the press-

* The groove is not distinctly shown in the cut (Fig. 6).—M. H. W.

ing-up of the gum when the floss-silk ligatures are placed about the neck of each adjoining tooth.) After all this had been done. and fine barbs were cut around the gold wire with a sharp knife-blade, oxychloride of zinc was placed in the pulp-chamber of the cuspid tooth, and, while the cement was still plastic, the crown was at once pressed to place, and for a few moments held there.

After the oxychloride of zinc had hardened sufficiently to safely admit of it, the cement was cut away from around the wire at such parts as would make proper anchorage for the gold. There was, and in every case should be, a little space left between the wire and cervical wall to be filled with gold for the protection of the enamel at this part. Narrow pieces of light cohesive foil were first placed in this space with small, suitably-curved instruments, and afterward solidified with the mallet; after which a little larger (though still narrow) and heavier (none over No. 32) pieces of folded foil were used for placing around and about the wire in the root, filling the cavity, restoring the contour, and covering and protecting the prepared margins of enamel: each piece of the gold being thoroughly cohesive and made compact with the electro-magnetic mallet. The surface of the gold placed around the wire between it and the cervical wall, as well as all that part near the gum, was smoothly finished with small files and very narrow ($\frac{1}{16}$-inch wide) strips of emery-cloth before the removal of the rubber dam; after which the remainder of the gold was made smooth and so trimmed down as to be sure of the proper occlusion of the teeth. The crown attached to the cuspid tooth was made just short enough to be free from the striking of the lower teeth. The operation was finished at another time with Hindostan stones, together with pumice upon fine wood made into suitable shape.

When a crown can be securely attached to one instead of two teeth, the time of building-in is lessened about one-half. The slight movement which takes place in the socket of the tooth supporting the crown is not interfered with as when two teeth are fixed together by the gold wire holding the porcelain. If it should afterward become necessary to perform operations upon the adjoining teeth. the rubber dam can as readily be applied as before attaching the crown.

PLASTIC GOLD ALLOYS.

BY W. G. A. BONWILL, D.D.S., PHILADELPHIA.

(Read before the Odontological Society of Pennsylvania, January 7, 1882.)

There is no true man of experience in our profession who has not longed for some plastic material to use as a substitute for gold foil in many operations. This desire has led many to enter into

experiments upon some of the old amalgams, and, in a few cases, to bring out new combinations. Their efforts have not been futile, as much progress has been made. The discussion regarding galvanic action led many astray in searching for an alloy containing the smallest amount of gold,—just sufficient to cause it to harden somewhat more rapidly,—and also to bring in combination other metals that would set up galvanic action within themselves, to the better preservation of dentos.

I had hoped much for the "new departure" alloys, but the principles involved seemed to me to be incorrect, and I was forced to look further. The alloys made by this school aim to supplant gold with other metals. Some are prepared for quick setting, making use of metals, as before stated, having galvanic action among themselves, and not on the dentos. My experience in gold working was different from theirs. I felt that if gold could be more largely used in alloys there would be less oxidation and dissolving of tooth-substance. Whether my experiments will prove all I had hoped for remains to be seen; so far, the appearance of operations performed more than a year ago is satisfactory, and, I believe, indicates a move in the right direction. The experimentation necessary to secure an alloy adapted to setting crowns led me into the extravagant use of fine gold foil in connection with mercury. I found that seven per cent. of gold placed in the alloy of pure silver and tin, in connection with specially prepared mercury, containing a small quantity of pure gold, would give an article such as I wanted for pivoting purposes and for the base of large fillings. This gave less discoloration, was quicker in setting, and more solid under compression than any other. It was absolutely necessary that the mercury should take hold of the alloy immediately, and that no time should be wasted in rubbing it in a mortar or in the hand. It was also desirable that no valuable time should be lost in washing or pressing. The mass must become grainless at once, and perfect amalgamation be insured before leaving the hand or mortar. Only slow-setting alloys need compression with pliers. To secure this the proper treatment of the mercury is a very important matter. This preparation of the mercury, used with an alloy containing a larger percentage of gold than any I could purchase, led to a further step. Seven per cent. of gold in the alloy would work well, and not set too quickly, if the shavings were very fine and clear, provided that the mercury was absolutely pure, and that no time was lost in amalgamating, and the right quantities of alloy and mercury were used: and provided, further, that the silver and tin were proportioned to that per cent. of gold. More than seven per cent. I have not found useful in the alloy. It was a question whether or not it

would set quickly in this shape, and have sufficient edge-strength or retain plasticity long enough for contouring or conforming to the walls of the cavity. Time alone could tell. Sufficient tests were made out of the mouth, in tubes and porcelain crowns, to justify a trial in the mouth. The experiment was necessarily costly, and might have resulted in much damage to the teeth operated upon and caused me much annoyance; but it had to be made. The results have amply justified the operations. I had my cases come back frequently for examination, when with a strong lens I examined them to see if any defects could be discovered at the edges, and whether or not there was any oxidation, bulging, or displacement of the mass. In one case, where I had placed many very large contour fillings in the teeth of the lower jaw, in a mouth whose secretions were well calculated to discolor even gold itself, I found one side in good condition and satisfactory, and the opposite one oxidized and darkened. Examination soon revealed the cause to be that the rubber attachment on the gold plate was in contact with the fillings, and that the sulphur had united with the silver in the alloy. This was corrected, the filling again smoothed and polished, and, so far, discoloration has never recurred. A few fillings have discolored or tarnished in very acid saliva, but no oxidation on the surfaces or destruction of the metals at the margins, as in the one above cited, has become apparent.

The treatment of gold with mercury is, I believe, new. Some have informed me that they mixed fine foil with mercury at the time of preparing the alloy for filling, but never kept it for use in the finely-divided state. If success is possible through mixing gold and mercury, it can only be secured as herein described. It is singular that the alloy does not set as rapidly with the twenty-per-cent. gold-mercury as with the mercury alone; and it can be manipulated longer in the mixing, and while being placed in the cavity of decay. It requires nearly an equal quantity of the twenty-per-cent. gold-mercury to mix with the alloy, while with the plain mercury at least one-third less is sufficient to harden it. The fine gold which has been perfectly amalgamated by the mercury goes to the silver and tin of the alloy on mixing, to become mechanically and thoroughly incorporated with it. The smoothness and plasticity of the mixture is remarkable, the change being immediate; not requiring many minutes, as with those alloys containing no gold, or but a trace of that metal. Discoloration will be observed on the fingers as the result of its fineness, and from the fact that pure gold is oxidized when brought in contact with mercury. In such mixtures there is no necessity for washing or pressing. The mass is so dense that if the proper quantity of mercury be used it will be difficult to

wash it. If the little free mercury contained could be pressed out of it, the mass could not be molded into contour, or made tight against the walls of the cavity.

In the use of these alloys no more mercury should be taken in the hand than is required to make a thick mass. A little might be pressed out with the fingers, but it would be difficult. When placed in a cavity bibulous paper should be laid over it, and a blunt-pointed plugger used to condense it. The paper keeps the mass from slipping away under a smooth or even a rough instrument. Whatever amount of free mercury may be in it is forced to the top, and is wiped off or taken up mechanically by the paper. The mercury should never be allowed to concentrate around the margins, where edge strength is so desirable. Where the filling can be reached with the fingers, the mass can be made free from mercury by pressure with paper. The fingers are admirable adjuncts in plastic work. Wet bibulous paper is excellent for giving contour work the final touch.

Where fillings are large, several mixings of the alloy with mercury must be made. It cannot be expected that even an expert could take a large mass of this alloy and use it before a change occurred by crystallization.

There is great gain for an extensive contour filling in mixing at least three times. Where there are several small fillings to be made, let them all be prepared beforehand, and then what is left from one filling can be utilized in another, thus saving much material. By first pouring the mercury in the hand, there is less chance for waste, and it will not be necessary to weigh the alloy or mercury if the operator is quick in his movements. Everything must be in readiness for filling before the mixing is begun, or hardening will commence and cause the loss of the mixture.

There is one thing that must be observed in the use of any plastic alloy, if success is to be looked for, and that is the necessity of so preparing the cavities that no very acute angles of alloy are presented on the grinding or other surfaces. The walls should be covered with a thick body of the plastic, or, if not entirely covered, the exposed part should be so shaped as to present a perpendicular line to the pressure exerted thereon, or the filling on its margin next to such exposed edges of the wall should be so obtuse that there will be no possibility of its giving way during mastication. This is a very vital point, and hundreds of teeth have had their buccal or lingual walls broken from want of such protection, even where gold had been used. I cannot emphasize this too strongly. It is so easily done with small corundum points that there can be no excuse for its omission. In many cases it is better to remove a portion of the

antagonizing tooth, though solid and perfect, in order that the walls may be well protected with the alloy. When this is done, the most fragile alloy will secure such wrecks equally with the finest gold filling, and better in many cases. Where the cavities are approximal, the most minute and difficult to fill can be reached without cutting away so much of solid tooth-structure as when gold is used.

I have found that, where gold fillings need patching, the twenty-per-cent. gold-mercury filling keeps its color remarkably well, while others with less gold discolor badly. This observation I think can be relied on, and, if true, is of some importance. It is certainly inevitable that the practice of the future will make less use of gold, and that a better class of alloys containing gold will be introduced and used in proportion as confidence increases in a good article. It will not only be more economical, but the remuneration for services will be equal to that for gold work.

Until the cheap amalgams are abandoned, we need not hope for better work from plastics; but the period is drawing near when those who never were and never will be good operators in gold will be enabled to perform better operations for their patients. The fear that plastics will lower the standard of the profession is absurd. Let every man be properly educated, and then it will not matter what he uses if he has the qualification to stamp all he does with success. The public desire that which will preserve the teeth from further decay, and retain, as far as possible, their beauty and symmetry. Patients only know what is taught them by their dentist. Mine respect me when I tell them I am not willing to use gold as liberally as heretofore, but prefer an alloy in special cases. Some, who have just come from the hands of others who use gold almost exclusively, make some objections at first, having been educated to believe that gold was superior to all other metals. When, however, they are reminded that failure has occurred in three-fourths of the large operations, and are assured that the alloys can restore the contour of the cut-away, decayed, or broken teeth, and can be made far more useful than the old flat-faced, narrow, self-cleansing-surfaced filling, they arrive at correct conclusions.

With plastics contouring can be accomplished with success, though requiring skillful manipulation; but contouring with gold is such a strain on the nervous system that few can or will bear it. Opposition to the inevitable is useless. We must resort to something besides gold in the majority of cases occurring posterior to the incisors. As to the latter, we should be ashamed of ourselves if we failed to save seven-eighths of them without resorting to filling at all. If we desire to avoid the necessity for the wholesale extrac-

tion of the natural teeth, and their substitution by artificial ones, let us recognize the plastics more largely in our practice.

Use always the materials which return the best results, irrespective of their cost or by whom made. Prepare every cavity as if it was to be filled with gold. Leave no fragile walls exposed to antagonizing forces, but protect with metal. Make obtuse angles on the grinding-surface walls, that the filling may present no sharp or thin edges to be broken away. Force it into each cavity with Japanese bibulous paper under the point of a plugger. When practicable, place a temporary matrix, made of gutta-percha, on the buccal and palatal walls, the object being to force the alloy into a denser mass and bring the mercury to the surface. This matrix can be easily held by the fingers. Its use will be found to be of vital importance to the perfection of the operation. Shape the filling with great care as it hardens. Wet cotton or paper is admirable for contouring the surfaces. A magnifying hand-glass is a *sine qua non*, and should be used in all cases. Carefully examine the occlusion of the teeth, to avoid any subsequent dislodgment of the mass. Many plastic fillings are rendered worthless by leaving them too full. During the hardening process go over them frequently with the burnisher. After the hardening process has been completed, thoroughly finish the margins with Scotch stone, and afterward with pumice and soft-rubber disk. Let a final inspection be made under a lens.

REGULATION OF TEETH MADE EASY BY THE POSITIVE SYSTEM.

BY J. N. FARRAR, M.D., D.D.S., NEW YORK CITY.

(Continued from page 355.)

No. XXI.

Non-Irritating Jack-Screws.

By the use of any jack-screw thus far described, there is a liability of causing irritation of the tongue from contact with the screw-threads, and possibly other angular points of the instrument. To overcome this objectionable feature I make and use, with great satisfaction to my patients, a kind which I have named "non-irritating jack-screws," which differ from the others mainly in the use of a sleeve or box, which covers the rougher portions of the instrument.

The construction of these instruments is somewhat more difficult than that of those described heretofore, but they are far superior. Figs. 130, 131, 132, 133, 134 are sectional views of some of the most useful modifications. These illustrations show so clearly how they are operated that it will require but little more explanation than a

brief mention of the connection of different parts. Corresponding letters on the figures indicate corresponding parts, as follows: B, screw; D, nut-ferrule; C, sleeve; A, F, spindle-points or tooth-forks.

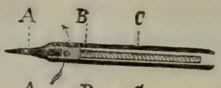
FIG. 130.


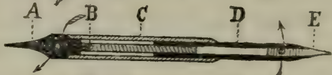
FIG. 131.


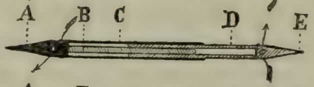
FIG. 132.


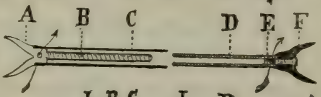
FIG. 133.


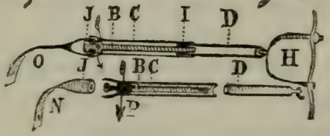
FIG. 134.


Fig. 130 illustrates the screw portion minus the nut portion of the jack-screw. The screw, B, having a head shaped as shown by the lighter portion of the figure, has a socket opposite the screw, in which is fastened a non-oxidizable spindle-point, A, made of platinum and iridium. Around the head of this screw is also soldered or screwed a sleeve, C, made of a piece of tubing or ferrule, which extends the entire length of the screw, as shown. The point pierced by an arrow indicates a hole for the introduction of a lever-key to operate the instrument.

Fig. 131 illustrates the screw portion in connection with the nut portion. The sleeve end, A, B, C, of this modification differs from the other in the head and spindle-point being made of one piece of metal, instead of being made separately and subsequently soldered into the head. The nut portion consists also of threaded tubing, D (inside), into one end of which is soldered a spindle-shaped piece of steel, brass, or platinum and iridium. If the oxidizable metals are employed, they should be nickel-plated before being used, in order to preserve their delicate points from being destroyed by oxidation.

Fig. 132 illustrates a modification differing from the others by the nut-ferrule, D, and spindle-point, E, being made of one piece. This is not only more difficult to make, but possesses no advantage over the others. The sleeve portion, however, is thinner and more comfortable, because less bulky.

Fig. 133 illustrates a bifurcated jack, consisting of a screw, B, and forked head, A, made of one piece, with a ferrule, C, soldered to the neck, as shown, all of which rest stationary when used, while the nut portion, having a swivel-joint at the point F, between the ferrule, D, and the fork, E, is turned with a lever-key.

Fig. 134 illustrates, in different sections, O, N, P, a draw-jack-screw made upon the non-irritating plan. This differs from the push-jacks only in the use of a swivel, J, ribbon O or N at one end, which in practice is intended to be attached to a clamp-band around some tooth to be moved, while the other is attached to a clamp-band, H,

as an anchorage: D. D. shows the tubular form of the nut portion in which extends the screw, B.

(To be continued.)

THE AMALGAM QUESTION.

BY J. FOSTER FLAGG, D.D.S.

(Concluded from page 370.)

AND is this *all* that should now be said for amalgam? Is it sufficient that its calumniators, in the guise of *scientists*, shall be merely rebuked, and their work shown to be unworthy the regard, much less the respect, of those who have the good of their fellow-men truly at heart? Is it sufficient that the *bad things* said of amalgam shall be shown to be *not true*, and then, that amalgam shall be left to continue its fight alone and unaided by any word of encouragement or any showing of those virtues and intrinsic merits without which it *never could have made the "thousands" of the day of Professor Harris count by the "millions" of the present time?* It seems to me that this would not be just. It seems to me but fair that a material which has so untiringly, so nobly, so successfully fought for itself, should now have help, even though that help should be no more than *I* could give it.

It has been a faithful friend to me and to "mine." It has enabled me to do comfortably and *satisfactorily*—no other word so fully expresses it—hundreds, ay! thousands of operations which had been most unsatisfactorily and most uncomfortably attempted before, only to result in comparatively prompt failure. It has enabled me to save hundreds upon hundreds of "abandoned" teeth. It has enabled me to restore confidence in dentistry to hundreds of patients who had almost utterly lost it at the hands of the best gold-workers that our country can produce. It has enabled me to evoke such words of gratitude and blessing from the lips of those who had only known dentistry as a torture that my heart has repeatedly filled with joy that it had been given me to work with. It has demonstrated to me that there is something *more* in dentistry than has been granted to it from the narrow range of criterion for excellence which has been so pertinaciously adhered to by those whose highest idea of *professional* (?) attainment is represented by an intensely solid, intensely polished, intensely elegant gold filling. It has opened to me a view of possibilities such as my most enthusiastic longings, at first, had never dreamed of. It has been to me the *foundation* for the realization of a practice in "plastics" that has given joy to me in the doing, joy to the patients in the having done, and joy to students in the beauty of its unfolding.

Feeling thus toward it, how could I do other than speak for it? How could I do other than condemn unceasingly and unsparingly every consecutive attempt at decrying and maligning it? How could I do aught else than *strive* to so present its capabilities, its reliability, and its claims, not only to respectful recognition, but to *hearty welcome*, as a wonderful means for the accomplishment of most desirable ends, that my professional brethern should be made desirous of investigating fully, freely, and with no fear of *taint*, that which had wrought so much for me.

It has been well said that "amalgam is a special providence;" that "it has come in the order of the Divine beneficence to supply an imperative need." If ever suffering men, women, and children have *cried aloud* for help in dire distress, it has been under the effort to force *gold* upon them as the "best" of filling-materials. If ever facts have piled up mountain-high *against* the persistent teachings of a jeweler theory, it has been during the *regime* of what has been known as "first-class" dentistry. If ever teeth have been uselessly, cruelly, ruthlessly sacrificed, it has been during the past fifty years. If ever the manufacture of "china teeth" has flourished apace, it has done so during the last twenty or thirty years. If ever the people have been thoroughly disgusted with professional endeavors, they are so *now* with "accepted" dentistry. It is a laughing-stock and a scorn, and is most emphatically so viewed by those who know most of its needless inflictions and its dreadful short-comings.

And what has amalgam to do with the correcting of all this? How is amalgam a "special providence?" How does it "come in the order of Divine beneficence to supply an imperative need?" Its components—as components—have *nothing* to do with the answers to these questions. This is not a matter of silver or of tin, of copper or of *mercury!* We have to deal with *amalgam* as *amalgam;* and what can I say of it? I can say of it, that, with a most extended experience in dental practice, covering a period of more than thirty years, and very largely in connection with the softest, frailest, and most hopeless kinds of teeth, I have found *no other filling-material so* GENERALLY *subservient to excessive demands, and so* GENERALLY *acceptably responsive to extraordinary requirements.*

I can say of it that it possesses characteristics which enable the experienced manipulator to do with it almost everything which demands excessive delicacy and gentleness: almost everything which calls for strength and durability; almost everything which bids defiance to every other material; almost everything which it *seems* impossible should be done.

In "dry" work its monuments of endurance are as numerous as the trees in the forest, while in "wet" work our "submarines" do

all the combined duty of the diving-bell and the diver, *and do it well.*

Amalgam has been the entering-wedge for the "plastics." It has been, and is, equally, the "first choice" and the "forlorn hope." If one's *life* depended upon the *durability* of a filling in a frail tooth of poor structure, with cavity so situated as to be exposed to attrition, I do not believe the *dentist* lives who would DARE fill it with anything except *amalgam.*

It is these peculiarities of amalgam that have given it its power. It is *not* because it does not paralyze; it is *not* because it does not ptyalize; it is *not* because it does not kill; but it *is* because *it does its work.*

Slowly but surely it has proved this; slowly but surely it has lived its life of works rather than words; slowly but surely it is continuing to give the lie to its maligners and traducers; slowly but surely it is forcing itself to the front as one of the *most worthy* of all the materials that have ever been devised for filling teeth.

Nor is it alone as a mere filling-material that amalgam presents decided claims for marked consideration; for in the doing of numerous things, such as varied pivot operations; building of partial or entire crowns; replacing teeth and even blocks broken from artificial work; making guards to prevent occlusion in the treatment of periodontitis, or during the correction of dental irregularities, by merely adding on to existing articulating fillings; securing gold-plate crowns upon roots, and for many other uses, amalgam subserves in a manner equaled, in many respects, by no other thing. It does seem, indeed, as though it was entitled to be called "a special providence."

But it is not only because it subserves so many *such* purposes so well that amalgam may properly be styled "a special providence," and that it may truly be said of it that it comes "in the order of Divine beneficence to supply an imperative need," for I desire to impress the fact that it is even more to be blessed for *the manner in which it permits the doing* of these operations than for the doing of them.

THIS *is the point upon which much thought may well be expended; this is the* STRONGEST *of the many strong claims to favor which amalgam presents.*

With the scientific utilization of the various modifications of amalgam alloy which have been presented to dentistry by the labor of the "New Departure Corps," an adaptation of means to ends is accomplished which is simply delightful.

To the operator the workings of "submarine" and "contour" are nothing less than a joy, while the comfort and safety, in the presence of possible future trouble, which is felt in the use of "facing" is known only to those who have had an experience.

And if these considerations are so satisfying to the dentist, what must they be to the patient?

I have said that amalgam is "even more to be blessed for *the manner in which it permits the doing* of these operations than for the doing of them," and it is *this* which is entitled to more than half the credit for the steady, solid progress which amalgam has made.

I could illustrate this by the narration of many hundreds of cases of hope renewed after it had been almost blighted; of fears allayed which had been nearly crushing; of comfort restored where had been anguish and dismay; and when I can say, with earnest thankfulness, that to *amalgam* I am most indebted for all this glorious relief to mental and physical suffering, it cannot be that I could view with other than feelings of the strongest condemnation any and every attempt to cast obloquy upon this "special providence" sent "in the order of Divine beneficence to supply an imperative need."

What is the imperative need? For more than fifty years dentistry has waged war with dental caries. For more than fifty years it has been thought and taught that gold was the "best" material with which to do battle. For more than fifty years *this one material*, in all varieties of texture, form, and quality, has been persistently placed in the front, while every other thing that any one, at any time, has used is placed *authoritatively* far in the rear; and some are styled "temporary," and others "vile."

For more than fifty years the difficulty, the exceeding difficulty, of working gold has been most fully recognized, and most ingenious instruments and appliances have been devised and employed that the work *with gold* should be more perfectly done.

It has been deemed of little moment that the torture endured in the use of these instruments and appliances has been such as fairly to rival that of the most horrible cruelties ever inflicted by savage or enlightened barbarians. It has been deemed of little moment that strong and healthy patients should have been so prostrated by dental operations that they have never since been, physically, as they were before. It has been deemed a matter worthy of little thought that patients have suffered till *they could suffer no more* FROM VERY FEAR; and when these poor unfortunates, broken in health, broken in spirits, and broken in heart, have, at last, been driven to wholesale extraction as the "first-class" means of escape from all this direful trouble, they have been offered, just as blandly, "artificial substitutes" *on gold*, with the stereotyped indorsement of "elegant," "artistic," "*best!*"

Everything in dental practice has been made subservient to *gold*. Its introduction was a tedious, painful, exhausting, expensive opera-

tion; its conductivity was pulp-destroying; its failures were frequent and rapid at the "vulnerable spot"—and yet—*it was the best!*

It was noted that with every failure of the fillings the quantity of tooth-material became less and less; the walls of the cavities became thinner and more fragile; the pulps became more nearly exposed and more easily irritated—and yet—*gold was the best!*

In time, tooth after tooth was lost, many after having been filled three, four, five, *or more* times; artificial teeth were resorted to, and the partially or wholly toothless patients were complacently informed, in the face of all this wretched failure, that there was still the satisfaction of knowing that the efforts had been made by the "best" men, in the "best" manner, and with the "best" material. What a comfort! Who could presume to ask for more?

And yet there were *dentists* who were not satisfied—dentists who were anxious to do *even better than this* for their patients; and they found patients who were not satisfied, but who, on the contrary, were eminently dissatisfied—dissatisfied with the results which were being produced in their own mouths; dissatisfied with the results which they saw in the mouths of their relatives and friends; *much dissatisfied with the prospect for their children.* These joined in a work for reform,—a work which should ignore the fundamental principles of that practice which had wrought, with its elegant, high-style, fine-polished tooth-jewelry, so much waste of valuable time, so much expenditure of hard-earned money, so much fear, suffering, and agony, and such dreadful loss of priceless teeth.

At first the revulsion was extreme; it was naturally so; it was the great swing of the pendulum in antagonism; the work of "*tooth-salvation*" was begun in earnest! What cared workers or patients for *skill?* Skill had failed, miserably, in its effort at saving teeth. There was no denying it; the manufactories for porcelain teeth were multiplying throughout the whole civilized world; the *demand* was increasing, and the *supply* was being afforded in response to it.

It was not alone the *poor* who lost their teeth,—it was not alone those whose teeth were "*not properly attended to*" who lost their teeth,—but it was conspicuously noted to be those who had done their part nobly, who had given most liberally in time, trouble, endurance, and expense, to the end that the "best" should be secured. These lost their teeth, and *everybody* came to know it; and yet the "eminent" and "respectable" wrought on and *taught on* about this and that *gold*, thick and thin *gold*, soft and cohesive *gold*, shred and leaf *gold*, sponge and crystal *gold*,—gold—gold—gold! And in the good, strong teeth the gold fillings lasted for "thirty or forty years," and *no one* wished for anything better than this; and from the poor, frail teeth the gold fillings persistently *dropped*

out, and finally these teeth were extracted *because* they were "not worthy to be filled with *gold*:" and *some people* wished for something *better* than this! Thus it was that an "imperative need" came to exist, and thus it was that, about twenty-five years ago, it came to be recognized.

Then began the slow and tedious work of careful experimentation and patient observation; the conduct of despised and maligned materials was noted; the results of "temporary," "careless," "unskillful" work were watched with interest and surprise; and amidst these satisfactory results those of "vile" amalgam were singularly conspicuous. In all its blackened hideousness it *saved the teeth* most loyally. With all its asserted concomitants of "ptyalism," "nervous prostration," and "paralysis," it gave those who had been induced to try it perfect comfort and complete satisfaction. The teeth which were "not worthy to be filled with gold," but which patients had insisted upon having filled with amalgam, and frequently in defiance of earnest and *conscientious* protestations upon the part of those dentists who, unwillingly, used it as a last resort, were found *eminently worthy to subserve the useful and legitimate purpose of mastication, and to continue to do so almost indefinitely.* As patient after patient died who had for twenty or thirty years a trial of ten or twenty amalgam fillings, it was noted that they died of pneumonia, heart-disease, accidents, or *old age*, just as those patients did who had gold fillings or artificial teeth, and no physicians gave certificates of *death* from amalgam! This was strange,—so strange that it took many years to see it; but it persistently pressed to the front and *insisted upon being seen!*

Meanwhile the call gradually became louder and stronger for the "ideal" filling. An amount of work for this has been done, the extent of which is known only to those who have labored for it; and what is the result? *Practically nothing.*

It is not that men of only ordinary ability have been engaged in this, for excellent chemists, excellent metallurgists, excellent dentists have joined in the effort. If the "eminent" of our profession have not given of their immense erudition and capability to the achievement of this great desideratum, *the more to their discredit*, for they best knew of the need.

If "skill," "power," "science," "labor," "knowledge," "first-class ability" were what was requisite for the attainment of the "ideal filling," why did they not give of these in profusion, and thus *produce it?*

All sorts of materials were mixed with gutta-percha; all sorts of materials were mixed as cements; fusible metals were compounded; single metals were prepared in all diversity of form; and chlorides,

and silicates, and phosphates were offered in almost limitless variety of device,—and yet, what have they amounted to? Each has been heralded with much laudation of its value; each has, in turn, been advertised as the "best plastic filling ever offered to the profession;" but what is the *truth?* It is that *amalgam* has firmly held its position as pre-eminently *the plastic of all plastics* for filling teeth.

No other filling-material which has ever been devised can, in the least, compete with it for *general utility* and for *variety of excellent attributes;* no other plastic has its *hundreds of thousands* of enduring monuments; no other filling-material has so decisively and so grandly earned for itself such marked credit for obtaining most unexpectedly satisfactory results under most notably unfavorable conditions; no other filling-material than *amalgam* has triumphantly established a claim which entitles it to rank as "*a special providence*" sent "*in the order of Divine beneficence to supply an imperative need.*"

From the hand of dentistry has been vouchsafed the bestowal of two great blessings to suffering humanity; each of these has been severely tested; each has had its share of opposition, malediction, and defamation; each has borne well the shock of battle, beating down opposition, rising above malediction, hurling defiance at defamation; each has been gloriously victorious.

These two *inestimable boons* are ANESTHESIA and AMALGAM.

PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

REGULAR meeting held March 21, 1882, at the office of Dr. Wm. Carr.

The president, Dr. Perry, in the chair.

[Dr. C. F. W. Bödecker read a paper on "The Minute Anatomy, Physiology, Pathology, and Therapeutics of the Dental Pulp."*]

Dr. Bödecker. Since writing this paper I have read an article, published in 1868, by the late Franz Boll, who saw the medullated nerve-fibers lying between the odontoblasts. This valuable discovery, however, has been altogether disregarded, and it seems, judging from the literature of the subject, that nobody after Boll has seen these fibers. An abstract of this excellent article, together with the rest of the literature of the dental pulp, I shall give in the next paper.

Dr. Mills. It seems that Dr. Bödecker confirms the opinion that an artery does penetrate the pulp-tissue.

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* This paper was published in the June number of the DENTAL COSMOS.

Dr. Bödecker. I have frequently observed arteries in the pulp, especially in the root portions, and sometimes I have seen them extending into the coronal portions of the pulp. Some of my specimens exhibit arteries or arterioles in the midst of medullated nerve-bundles.

Medullated nerve-fibers, when viewed longitudinally, are marked by a double contour (Dr. Bödecker illustrated these remarks by sketches on the blackboard) with fluted outlines. These varicosities are produced by the oblong nuclei in Schwann's sheath. The axis-cylinder, which is the conducting part of a nerve-fiber, cannot be seen in longitudinal sections. In cross sections, however, it is observable as a roundish glistening dot surrounded by the myelin, its sheath (Schwann's), and around this the internal perineurium.

Dr. Bogue requests me to say a little more about the odontoblast layer. The outer surface of the pulp, as you know, is surrounded by a layer of medullary corpuscles, which by Kolliker have been termed odontoblasts. Their form is not regular, like epithelia, as they are depicted in all the text-books, but they are made up of two, three, or sometimes four corpuscles like this (referring to the sketch), arranged in a row, and connected together by fine offshoots. In the vicinity just beneath the odontoblasts the meshes of the myxomatous tissue are becoming smaller, and very few blood-vessels are met with. Here the dentinal fibers have their origin, between these corpuscles, and this is also the case in the formation of secondary dentine, as I showed about three years ago. In this layer (near the odontoblasts) Franz Boll first saw the splitting-up of the axis-cylinder into minute nerve-fibrillæ. I have traced these nerve-fibrillæ up to, and some of them between, the odontoblasts in connection with their lateral offshoots, but further than that I have not been able to follow them. I first saw them in a section of a tooth of a nine-months human fetus stained with the chloride of gold solution. In such specimens the non-medullated nerve-fibers are easily recognizable as very fine, dark-violet, beaded-like fibrillæ, which sometimes terminate in knob-like bodies; but most of them may be followed up to here (referring to sketch), where they are lost between the lateral offshoots of the odontoblasts and dentinal fibers. Boll mistook some of the dentinal fibers for regular prolongations of medullated nerve-fibers. He thus describes two varieties of dentinal canaliculi, namely, those which receive the processes of the odontoblasts (dentinal fibers), and others which contain the nerve-fibers proper. Boll did not examine the pulp together with the dentine, but very carefully pulled the pulp out of a previously split tooth. In such a way small ends of the dentinal fibers are pulled out of the dentinal canaliculi adhering to the pulp, and these Boll describes as direct pro-

longations of nerve-fibers. The way a medullated nerve-fiber loses its insulation (the myelin and Schwann's sheath) is this (referring to sketch). Here is a medullated nerve-fiber, as usually seen in a bundle, which runs in a direction toward the periphery of the pulp, and gradually the myelin around the axis-cylinder becomes thinner, until at last nothing but Schwann's sheath with its neuclei is left. First these varicosities appear in regular intervals, gradually becoming scarcer, until they are lost altogether, when the axis-cylinder splits up into numerous fine fibrillæ.

Dr. W. H. Dwinelle. According to that figure the nerves of the pulp project themselves into the dentine through the dentinal tubuli.

Dr. Bödecker. That I cannot say positively. I have traced them to the lateral offshoots of the odontoblasts, to which they appeared to be connected, but further than that I have not been able to distinguish them as direct nerve-filaments, although there is no doubt that they indirectly blend with the dentinal fibers, which are living matter, as well as the axis-cylinder of nerve-fibers.

Dr. Mills. There is another point where Dr. Bödecker refers to the calcified and eburnified condition of the pulp, and the question arises whether or no it is proved to be so in most cases.

Dr. Bödecker. The calcific deposits have troubled me a great deal; at one time Dr. Heitzmann himself believed them to be fat, but after examining a great number of pulps with different reagents I have come to the conclusion that they are calcific deposits. I cannot say exactly how many pulps I have examined; a few I have mounted without cutting them; of others I have made from four to ten sections, and in two instances I have mounted over one hundred sections from a single pulp. I have examined over twelve hundred pulp specimens, which, with comparatively few exceptions, contained either calcific deposits, eburnifications, or ossifications. Most of the teeth from which these pulps were removed were either but little decayed or quite sound.

Dr. Mills. You came to the conclusion that this condition is a normal one?

Dr. Bödecker. I believe it to be physiological.

Dr. Dwinelle. You believe so, notwithstanding that inflammation of the tooth incident to caries has a tendency to form these granules?

Dr. Bödecker. Of course, caries, chemical and mechanical abrasion, or anything which will produce an irritation of the pulp, either directly or through the dentinal fibers, will tend to a new formation in the pulp, such as eburnification, dentinification, or ossification, which, when in connection with the primary dentine, is called secondary dentine, but I do not believe that calcification of the pulp is the result of caries.

Dr. Dwinelle. As when the nerve of a normal tooth is exposed by fracture, the irritation incident thereto induces a deposit of secondary dentine, which entirely covers and protects it. In the example of the elephant's tusk wherein a bullet has been lodged, by irritation secondary dentine is deposited all about it, even to the obliteration of the orifice through which it penetrated.

Dr. Bödecker. This sometimes is the case in caries. I have specimens where the dentine has been invaded by caries, which afterward has become reformed again into dentine. This is characterized by the irregular arrangement of the dentinal canaliculi, similar to that of secondary dentine, and the boundary of the primary dentine always exhibits a scalloped outline.

Dr. Mills. Dr. Heitzmann's teaching gives us the idea that recalcification is due to inflammatory causes. The question arises in my mind whether this may not occur in cases where the teeth are much crowded. We have found intense neuralgic pains arising from this condition, brought about by the inflammatory action caused by undue pressure. You stated that recalcification occurs at all ages, and, as the system is constantly exposed to changes causing inflammatory action, there is a tendency to disturb the physiological condition. It therefore seems to me that it is not proved that this is a normal condition, by any means.

Dr. Bödecker. I do not pronounce calcification of the pulp to be a normal process, but cannot regard it as pathological. As mentioned before, I have seen but very few pulps which did not exhibit traces of calcific deposits. With regard to the case of neuralgia arising from the teeth, I would say that I have several specimens of pulps, derived from persons afflicted with neuralgia, where after the extraction of the tooth, or the devitalization of the pulp, instant relief was obtained. But such pulps, without exception, exhibit eburnifications or ossifications. In the next part of my paper I will speak of these cases in connection with eburnification, ossification, and dentinification.

Dr. Dwinelle. In the most of your specimens, were they from decayed teeth?

Dr. Bödecker. Most of them were either quite sound or but little decayed.

Dr. Dwinelle. I suppose they were from Dr. Hasbrouck?

Dr. Bödecker. I particularly requested Dr. Hasbrouck to send me all the sound teeth he extracted.

Dr. Rich. This paper and the explanation shows how ignorant we are in this field which Dr. Bödecker has been investigating.

Dr. Mills. The question arises whether this can be an abnormal condition, or whether, starting from myxomatous tissue, its tendency

may not be to end, in advanced life, in calcification of the pulp as a normal action. It seems to me that this condition must be based upon an abnormal action.

Dr. Bödecker. I have examined a pulp from the tooth of a gentleman of about sixty years of age, which was mostly composed of myxomatous tissue, and contained about as many islands of calcification as a pulp derived from the tooth of a child of nine or ten years of age.

Dr. Mills. Had the pulp receded as usual?

Dr. Bödecker. Yes; the pulp was very small.

Dr. Buckingham, Philadelphia. I can say very little on this subject. It is a new one, and the doctor has used so many terms that we do not find in the books, that we would have to study and learn what ideas he wishes to convey by the terms he uses. As Dr. Rich says, it is a new and interesting subject.

I have read considerable on the subject, but have made no original investigation. I am glad Dr. Bödecker has taken up this subject. I have no doubt but he will throw considerable light upon it.

The whole process of the development and growth of the teeth should be reinvestigated and studied, and the investigators should adopt a uniform nomenclature. There are more erroneous opinions formed from the different terms used by writers than from any other cause. When there are various terms used to express the same idea, it is of very little importance which term is used so we understand the idea intended to be conveyed. The late Dr. Dean called attention to this in his translation of Magitot's work.

The next after a uniform nomenclature should be illustrations. Picture-writing is the oldest and best. When it can be used we can obtain a clearer idea than from pages of writing.

Dr. Rich. We must bear in mind that this paper is an advance upon all the information we have had on this subject. There is no treatise extant that gives anything like the information which this does. Even the best microscopists have not the information we have to-night; so we are absolutely without preparation for intelligently discussing the paper. No one but investigators can discuss any paper of this sort; none but microscopic investigators; and I have no hesitation in saying that Dr. Bödecker is in advance of every one else in the microscopic examination and investigation of the pulp. With Dr. Buckingham, I think that the interest in the subject would be greatly enhanced if we could have it illustrated by enlarged and colored diagrams properly prepared. We have to bear in mind that this is quite a new field of investigation, and many of the terms are new. It is to be hoped that many young men in our profession who have length of days before them will

feel stimulated to enter into these investigations. It is an immense field.

Dr. Bödecker. If I am able to find the time, I will, for the next meeting, prepare a few charts illustrating the normal and some of the pathological conditions of the pulp.

Dr. Rich. I do not think that the society should tax Dr. Bödecker's time to do this work. In my judgment, it would be money well spent were we to employ an artist to make the diagrams, under his suggestions; it could thereby be done without particularly calling upon his time.

There is a point about this investigation, as regards granules of bone in the pulp, that is new, because it has been generally supposed that this was an infrequent condition. Dr. Bödecker has demonstrated that it is almost the universal condition.

Dr. Bödecker. Granules of eburnification and spicula of bone ought not to be confounded with calcifications; the former two are new formations made up of a regularly developed tissue, but the latter is merely a calcific deposit in the tissue of the pulp. It is calcification of which I speak as being present in almost every pulp, and not eburnification or ossification.

On motion of Dr. Hill, it was voted that the society appropriate the necessary money for the preparation of such a diagram as had been suggested, and that the matter be left discretionary with the president.

On motion of Dr. Dwinelle, the society requested Dr. Bödecker to prepare a manuscript glossary of the terms used in his papers describing his investigations, with a view to its publication in due form.

Dr. Mills then read the following report of practical cases:

Mr. President.—With your permission, I will report some cases of more than ordinary interest.

Last July a gentleman was sent to me who was suffering from an acute inflammatory condition of the entire surface of the mucous membrane of the oral cavity. At five different points located in the sockets of the teeth the pain was intermittently more intense, and the patient had been obliged, before consulting a dentist, to resort to hypodermic injections of morphia to enable him to endure the suffering. The surface of the mucous membrane bore a peculiar appearance, being colorless and seemingly entirely bloodless, and at the same time was very sensitive to the touch, particularly at the festoons of the gums. Quite a good deal of recession of the tissue had taken place at the five points mentioned. The patient was about fifty-five years of age, of nervo-sanguine temperament, and had been capable of great endurance; but continuous and prolonged

application to his calling under great privation had overtaxed his powers, and the result was marked general debility, indicated by insomnia, lassitude, loss of appetite, extreme constipation, great depression of spirits, unusual excitability, and, lastly, intense suffering. He had lost but one tooth; the remainder were massive and strong, and in good condition. It occurred to me that the singular appearance of the tissues might possibly be caused by excessive mercurial treatment which he had undergone during fifteen years of frontier life.

In the management of the case I relied largely upon palliative remedies, associated with constitutional treatment. At the first sitting I applied aromatic sulphuric acid, but quickly discovered that it was the worst thing I could have done under the existing circumstances. Its application produced intense pain immediately, and I was obliged to resort to heroic remedies to control the suffering. Externally I applied tincture of aconite, and internally gave wine of opium in quantities sufficient to control the difficulty. After this experience I applied from time to time, externally, a saturated solution of salicylic acid, varying it in strength as the indications demanded, and alternating with a saturated solution of tincture of iodine, likewise varied in strength according to indications. I also used, experimentally, oil of eucalyptus. I found that *all* of these were more or less efficient. My reason for varying the treatment was that I found the organization fluctuated in its recuperative powers; some days there would be a decided reaction, but I could usually trace it to some deviation from regularity. The constitutional remedies administered were four grains of sulphate of cinchonidia and six to eight drops of nitro-muriatic acid daily. The patient was also sent to Fire Island for the tonic effects of the sea air and bathing.

I should state that the patient had resorted to stimulants and narcotics to enable him to carry out the line of work he was engaged in, so that when the tension was lessened his physical condition went down more rapidly. While under my treatment he was allowed a moderate use of alcoholic stimulant.

At the end of five weeks the patient was dismissed in a decidedly improved condition, with instructions to continue the constitutional treatment, and in conjunction with it to wash the mouth daily with the following: Salicylic acid, one drachm; glycerin, one drachm; oil of eucalyptus, forty drops; oil of wintergreen, one-fourth of a drachm; alcohol, two ounces; pure water, four ounces. I have seen this patient since, and he has now returned to his duties, and resumed his accustomed activity, with a very general improvement.

The second case is that of a lady about twenty-two years of age; temperament nervo-bilious; condition anemic, produced largely by

worriment over her affliction, aided not a little by the aggravated state of the local trouble. About a year ago, while in one of the distant cities of the South in attendance upon a sick relative, her strength was overtaxed, and she commenced to have trouble on the right side of her face, which finally developed excessive swelling and great pain, becoming very purple and in spots or large blotches nearly black. She consulted a dentist, who found that the pulps of the right superior lateral and central incisors were devitalized,—from what cause I have not been able to discover. The pulp-chambers were cleansed and filled, and a wash was prescribed, and the lady returned to her home in the Southwest. (I should not forget to add that some pieces of bone were removed at this time.) The case in the meantime did not recover. After being in the hands of three different physicians in her locality, by whom she was cut and lanced at varying periods without any good results, her mind became seriously over-excited, for, as she said, all the old ladies told her that in the end it would require a surgical operation, and this to her meant chloroform and the cutting and sawing of the flesh and bones of her head. Her father consulted me, and described the case quite intelligently, as it afterward proved, and asked my opinion as to the probability of its yielding to treatment. I gave him a favorable prognosis, and he thereupon brought her to me. On examination, I found an opening quite high above the end of the roots of the two teeth whose pulps were devitalized, from which came a copious discharge of broken-down tissue. I could readily with the probe touch the orbital plate. I found a good deal of roughness of the bone about the cavity.

I first reopened the pulp-chambers, and finding them in proper condition I reclosed them and commenced treatment, using aromatic sulphuric acid as a dressing, supplemented with the same internal remedies that were employed in the case previously described, viz., sulphate of cinchonidia and nitro-muriatic acid. After about ten days the nitro-muriatic acid was substituted by aromatic sulphuric acid, a change which proved beneficial. After a few local dressings I found pieces of bone becoming loose; during the first two weeks I removed, I think, eleven of these, some of them five-eighths of an inch in diameter and of irregular shape. I used the same local remedies, alternating as in the first case, as indications seemed to direct. The last dressings near the close of the treatment were wine of opium. Granulation proceeded rapidly, and the patient shortly expressed herself as feeling decidedly improved. In four weeks she was dismissed and returned home with instructions to keep up the constitutional treatment for two months longer. I have since heard from her that all is going well.

The third case is that of a lady some forty years of age, of nervo-bilious temperament, a good deal disturbed in mind and body because of her physical condition. She told me that some four years ago she had a superior second molar extracted. She did not see the tooth after it was taken out. She soon discovered that something was wrong; she could put her tongue into a large opening, which shortly became painful and discharged pus. Thinking that a portion of the tooth had been left behind she applied at another office, and an effort was made to remove the difficulty, but no root was found, and the only result was a larger opening in the jaw. The case grew worse, and the patient sought relief in vain, going from dentist to physician and from physician to dentist without avail; she felt that she was not well treated by some of those to whom she applied. I should say that she was a little peculiar, a good deal disposed to have her own way, and adhered to her determination to have *that root out.*

I diagnosed the case to be a fracture of the antral wall; not less than seven-eighths of an inch of the bone was gone; the posterior portion, the point where the pain and soreness were located, was necrosed. I wished to burr it away. This was something more than two years ago. I did not at that time get control of the case, although I tried to help the lady with dressings and constitutional treatment, and it was not long before she was out of my hands. Unexpectedly, last August, she returned, looking pale and weak; had been confined to her bed for some time. On examination, I found that the necrosed territory had extended and was in an ugly-looking condition. On syringing out the cavity I found it full of very offensive matter, which came away mostly through the opening at the back part of the nose into the mouth. I told the patient that the only thing to be done was to treat the case as I had formerly proposed to do—by burring out the necrosed bone. Having obtained her consent, I burred away a large portion of the bone at the first sitting, and continued to treat it unremittingly until the last of September, when I left home for a vacation. The patient had then improved greatly in every respect, without a drawback. The remedies used were, both local and constitutional, much the same as in the two previous cases. At the present time the discharge has ceased, and there is every indication that the lesion is healed.

Adjourned.

HARVARD UNIVERSITY—DENTAL DEPARTMENT.

THE annual commencement of the Dental Department of Harvard University took place on Wednesday, June 28, 1882, at Sanders Hall, Cambridge, Mass. The number of graduates was three, upon whom

was conferred the degree of D.M.D. Their names and addresses are as follows: Edward Earl Hopkins, Worcester, Mass.; Dwight Moses Clapp, Boston, Mass.; George Eubank, Birmingham, Ala.

HARVARD ODONTOLOGICAL SOCIETY.

The fourth annual meeting of the Harvard Odontological Society was held Saturday afternoon and evening, July 1, 1882, in Boston, Mass., the president, Dr. Eugene H. Smith, in the chair.

The following were chosen officers for the ensuing year:

Eugene H. Smith, D.M.D., president; F. E. Banfield, D.M.D., recording secretary; Frank Perrin, D.M.D., treasurer; F. E. Banfield, D.M.D., D. F. Whitten, D.M.D., E. C. Briggs, M.D., D.M.D., executive committee.

F. E. Banfield, *Recording Secretary*, Boston.

NEBRASKA STATE DENTAL SOCIETY.

The sixth annual meeting of the Nebraska State Dental Society will convene at Omaha, Tuesday, September 12, 1882, and continue in session two days.

W. F. Roseman, *Recording Secretary*, Fremont.

EDITORIAL.

DENTAL DEPARTMENTS IN MEDICAL SCHOOLS.

Through an oversight which we regret we failed to notice at the proper time the announcement of the establishment of a dental department in the University of California. The preliminary course of lectures was commenced April 1, the regular course June 1. The organization of the faculty, terms, etc., will be found in our advertising pages. Dr. S. W. Dennis, 33 Kearny Street, San Francisco, is the dean.

We have received the announcement of Rush Medical College, Chicago, containing information of the arrangements which have been made for instruction in dentistry. It is proposed to furnish students an opportunity to prepare themselves for the practice of dentistry in connection with their medical studies, and to grant certificates of qualification at the conclusion of the medical course. The session begins September 26.

The State University of Iowa, at Iowa City, announces the establishment of a dental department in that institution, sustaining to the University the same relations as do the departments of law and medi-

cine. The first session will open October 11. Dr. L. C. Ingersoll, Keokuk, dean.

The Collegiate Department of the Minnesota College Hospital, Minneapolis, has added to its curriculum instruction on the theory and practice of dentistry, Dr. M. M. Frisselle, lecturer.

BIBLIOGRAPHICAL.

BRUSHLAND. By JOHN DARBY, author of "Odd Hours of a Physician," "Thinkers and Thinking," "Two Thousand Years After," etc. Philadelphia: J. B. Lippincott & Co., 1882. 12mo., cloth. Price, $1.25.

That large class of readers who have been amused and profited by Dr. Garretson's previous books will be more than gratified with his latest contribution to general literature. Like its predecessors, "Brushland" has a mission; rather two of them—one eminently practical, the other partaking more of the esthetic. The practical idea which it teaches is the power of earnest endeavor skillfully directed to overcome even the most adverse surroundings. It is the story of the reclamation of a particularly unpromising spot in the Jersey "barrens" to useful agriculture. For its practical information alone the book is valuable. This is told in a manner as different from the conventional dry-as-dust recital of details as can well be; but added to this—rather mingled with it as an appetizing condiment—are gems of philosophic reflection and deduction, and pervading it all a genial humor that makes its reading a positive pleasure.

OBITUARY.

JOHN C. AUSTIN, M.D.S.

DIED, at Albany, N. Y., October 23, 1881, John C. Austin, M.D.S., aged sixty-four years.

Dr. Austin was born at Fenton, Staffordshire, England, in 1817. His parents came to America, and settled in Jersey City, N. J., in 1829, when he was twelve years of age. Having chosen the profession of dentistry, he studied with Dr. Alcott, of New York, and practiced three years in Jersey City, and in 1842 located permanently in Albany, where, by his energy, industry, and perseverance, he secured an extensive practice, to which he devoted his entire attention for a period of forty years.

Dr. Austin was one of the original members of the Third District Dental Society of the State of New York, of which he had been president, and in which he always evinced a warm interest, being

generally present at its meetings and actively participating in its deliberations. He was also a member of the New York State Dental Society, and on June 30, 1870, received from its Board of Censors the degree of M.D.S. He had the esteem of his professional brethern, and in the community where he resided his honesty and integrity won for him confidence and regard.

The Third District Dental Society of the State of New York, at its annual meeting held at Albany, April 18, 1882, unanimously adopted resolutions of appreciation of his character and respect to his memory, and extending their sympathy and condolence to the bereaved family.

DR. WILLIAM H. BANGE.

Died, at Hanover, Pa., June 24, 1882, of consumption, Dr. William H. Bange, in the sixty-third year of his age.

Dr. Bange had been in poor health for some time, his illness extending over a period of one year. He was a native of Hanover, Pa., having been born in that town on the 30th of April, 1820. He had practiced dentistry in his native place and in towns adjacent thereto for the past forty-five years, with a marked degree of success. He filled various positions of public trust, and was esteemed by the community as a man of sterling character and integrity.

FRANK H. COBURN, D.D.S.

At the June meeting of the Alumni Association of the Boston Dental College resolutions were passed in reference to the death of Dr. Frank H. Coburn, a graduate of the class of 1881, an obituary notice of whom appeared in our June number. The resolutions expressed regret for the loss of a young and valuable member of the association, whose graces of scholarship were united with purity of character, and extended sympathy to the bereaved family. The resolutions were ordered to be entered on the records of the society.

WILLIAM E. RIGGS, D.D.S.

At the April meeting of the Alumni Association of the Boston Dental College action was taken in reference to the death of Dr. William E. Riggs, a graduate of the class of 1874. Resolutions were passed expressing esteem for him as an associate and an upright and honored citizen, and sympathy with his family in their bereavement. It was ordered that the resolutions be placed upon record.

HINTS AND QUERIES.

"He that questioneth much shall learn much."—BACON.

CORRESPONDENTS desiring a reply in this department are requested to make use of *distinctive signatures or initials*, and avoid the practice of signing their communications Reader, Subscriber, etc.

CORRESPONDENTS who wish notice to be taken of their communications should authenticate them with their names. We cannot insert queries or replies except they are so accompanied. Names not necessarily for publication.

A FEW weeks since I opened a dead tooth (superior incisor), and disinfected with oil of cloves; filled the tooth a week ago, and it was then of good color. Now the whole crown is very yellow. What can I use that will restore the color?—A.

I HAVE a case of discoloration of the entire set of teeth, the color resembling that caused by tincture of iron. The patient does not know when or how it happened. The color extends throughout the substance of the teeth. Can any one suggest a remedy?—C. A. M.

IN the report of the New York Odontological Society, in the DENTAL COSMOS for April, Dr. John B. Rich describes a case of excruciating suffering from pain in a tooth, protracted through months of treatment, the cause of which was discovered, after extraction, to be spicules of bone in the socket. Will Dr. Rich kindly explain how he found the spicules; if glasses were used, what kind, and where they can be procured?—L. N. G.

WILL some one who knows give us the date when fusible alloys (such as lead, tin, antimony, and bismuth in different combinations) were first used to mend and repair broken sets of teeth on vulcanite and celluloid cases; also, the first time small screws for retaining the fusible alloy were used or recommended?—DENS SAPIENTIÆ.

CRITICISMS.—We have noticed several methods and points in practice in clinical reports and papers recently published in the DENTAL COSMOS, which, in our humble opinion, are open to a reasonable criticism.

Without mentioning authors, or specifying clinical operations, we will, in a general way, criticise the methods and modes of operation, and leave your readers to make the applications.

1st. We desire to repeat the condemnation which has been pronounced by others against the murderous practice of devitalizing pulps, but which, notwithstanding, seems to be continued by some of our would-be leaders in the profession.

2d. What reason is there in attempting to fill root-canals with gold, even if it were possible to do it as perfectly (which it is not) as with cements? We imagine we hear some one exclaim, "You are liable to force the plastic fillings through the apical foramen, and trouble will ensue." We answer, the same care exercised in introducing a small pledget or fiber of medicated cotton that is observed in introducing the first piece of gold will forestall any danger of that kind. Then, why attempt, by a long, tedious operation, to do with an unadaptable material, but imperfectly at best, what can be done so easily, quickly, and perfectly with an adaptable material? We say "imperfectly at best" because of the scores of gold-filled roots which we have extracted and examined we have *never seen one* whose imperfections did not "smell to heaven!"

3d. We see recommended soft or unannealed gold for the interior of cavities, with cohesive gold contour added thereto from the margin. To this we are forced

to exclaim, "*What folly!*" Does not experience teach every competent gold-worker that soft gold has not the cohesive quality requisite for the stability of ordinary contour work? Then, why use the weaker material clear up to, and perhaps beyond, the general point of failure in such fillings? But, says one, "The two qualities of gold cohere." Admit it. Does that fact strengthen the entire mass of soft gold used below? What difference whether the failure result at the exact point of union of the two qualities of gold or a hundredth part of a line below; does it make it any the less a weak filling?

We claim that in cavities where contour work is necessary, and gold proposed as the contour-material, as a rule, only cohesive gold should be used from a point within the cavity where ample and secure anchorage can be obtained. (We modify this statement below.) Any portion of a cavity below such a point may as well be filled with plastic filling as with soft gold.

Modification 1st.—The practice of using a few thicknesses of thin, soft foil as a lining about the walls of a cavity which is to be filled with cohesive gold is to be commended.

Modification 2d.—It has been our practice in some cases where there was an esthetic demand for a gold contour, where the cavity was large and the walls thin, to fill the interior with amalgam even to the margin, setting, at the same time, strong retaining-pins projecting to receive the contour, and at a subsequent sitting, after the setting of the amalgam, restoring with cohesive gold from the margins upward. Such work has proved very satisfactory.

4th. We have been astonished that professors of operative dentistry in our colleges, and also others high up in professional reputation,—men who you would suppose possessed a correct knowledge of the laws of mechanics, mechanical forces, adaptability of geometrical figures, etc., etc.,—should use and recommend cohesive gold in the form of cylinders, cubes, and pellets, when, at the same time, they admit and teach that the *sine qua non* of a gold filling is tightness and compactness. At the same time they try to accomplish the desired result by mechanically forcing together in a given space of irregular outline a series of metallic cylinders which are coiled from center to circumference, each of which can be condensed longitudinally only to a disk, and laterally to an elliptical figure with two thicknesses of foil at the nodes, and perhaps a dozen at the center, or, what is still more difficult, take cubes and pellets and attempt to obtain equally perfect adaptation to the walls and the same solidity throughout, with the same amount of mechanical force applied, that can be obtained by nicely folded leaf cut in strips to suit the size of the cavity, and folded back and forth from wall to wall, condensed layer by layer.

To use a homely illustration,—What shipping-clerk in a drygoods house, were he required to pack the greatest possible number of blankets in a given box, would first roll each blanket loosely into a cylinder, or bundle them up into cubes, or wad them up into balls, and in these forms expect to accomplish the desired end, and, of course, have the least aggregate of interspaces?

On the contrary, would not common sense teach him to fold them the width of the box first, and then fold them back and forth from side to side smoothly, pressing them down repeatedly?

Whatever course the clerk might pursue, we are prepared to say that experience and experiment have confirmed our judgment, that much better cohesive gold fillings can be made with the same amount of mechanical force by using the material in the form of smoothly-folded strips of foil—say, from No. 2 to 4—than in any other form.—Rex, Lincoln, Nebraska.

THE

DENTAL COSMOS.

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ORIGINAL COMMUNICATIONS.

THE MINUTE ANATOMY, PHYSIOLOGY, PATHOLOGY, AND THERAPEUTICS OF THE DENTAL PULP.

BY C. F. W. BÖDECKER, D.D.S., M.D.S., NEW YORK, N. Y.

(Read before the New York Odontological Society, April, 1882.)

[Concluded from page 402.]

III.—Therapeutics.

In the September number of the Dental Cosmos for 1876 there was published a paper, by Junius E. Cravens, D.D.S., of Indianapolis, Indiana, entitled "Lacto-Phosphate of Lime, Pathology and Treatment of Exposed Dental Pulps and Sensitive Dentine," in which attention was called to the injurious effects of pure carbolic acid and creasote in the treatment of exposed pulps. This article seems to have awakened the interest of several thinking minds. At the meeting of the New York State Dental Society, a few months later, Dr. W. C. Barrett, of Buffalo, read a paper on "The Use of Creasote in Treating Simple Exposures of the Dental Pulp. Is it Correct Practice?" This again directed my attention to the subject. Before that time I had usually capped exposed pulps with either a solution of gutta-percha in chloroform, or with zinc oxide mixed with creasote, filling the rest of the cavity with oxychloride of zinc, from which I had to record quite a number of failures. I tried to save every pulp as long as there appeared to be life. Arsenious acid, which, before I became acquainted with Dr. Wm. H. Atkinson, I had used freely, I had, like him, laid aside altogether. In July, 1879, I read the work of A. Witzel, and felt sure that every tooth treated with arsenious acid in the manner described in that work would, sooner or later, cause trouble. At the meeting of the American Dental Association held at Niagara Falls in August, 1879, I, as well as Dr. Atkinson, severely criticised Witzel's work and his advised use of arsenious acid. To-day, however, I have to corrobo-

rate some of the assertions of Witzel, and believe that without arsenious acid the dental materia medica is incomplete.

I have been asked, "Is the knowledge of the minute anatomy and pathology of the dental pulp of any practical value?" My answer to this question is that I believe it is impossible, without this knowledge, to treat successfully all the difficulties that present themelves. To decide what the mode of treatment shall be,—whether a pulp, when exposed, can be capped, or had better be destroyed,—depends, in a great measure, upon a thorough *scientific* as well as practical understanding of the organ to be treated. If these querists, after due consideration of this paper, are led to corroborate this assertion, I shall feel more than gratified.

In chapter II. of this paper I have described the microscopical appearances of the inflammatory process in the pulp, omitting its clinical features. These will, in connection with the therapeutical part of our subject, be of greater interest.

In order to make the different stages of pulpitis comprehensible, I will describe in few words some of its most characteristic symptoms:

Inflammation of the pulp may occur in one portion or in several independent portions at the same time, or may implicate the whole organ.

It is of importance to be able, as far as possible, to distinguish the different stages of inflammation in the pulp. In a great measure successful treatment depends upon a correct diagnosis of the degree to which the disturbance has advanced; whether there is present a hyperemic condition, an inflammation involving a part or the whole of the pulp-tissue, or a dying pulp.

A hyperemic condition of the pulp exists when the patient experiences pain only when the tooth affected comes in contact with anything hot, cold, salty, sweet, or sour, etc., the pain lasting but a few minutes, and ceasing as soon as the irritant is removed.

When a tooth is attacked by caries, or suffers from any lesion which allows the approach of an irritant near to or into the pulp-chamber, a partial inflammation, in the majority of cases, is, sooner or later, the result. Slight pain, with long painless intermissions, first occurs, but the paroxysms of pain gradually increase in length until they sometimes last an hour, the intermissions being correspondingly shortened. Pressure applied in the vicinity of the exposed pulp produces intense pain, which does not subside with the removal of the pressure. Upon the application of heat or cold the tooth aches for an hour or more, but an application of pure carbolic acid or creasote abates this. The tooth as yet is not at all sensitive upon percussion, and is as useful as before, except when, as in mas-

tication, foreign matter is pressed upon the pulp. If the decayed portion of the dentine, which generally still covers the pulp, is very carefully removed with a sharp excavator, we observe the exposed portion of the pulp as a light-red dot, with a little blood escaping from the pulp-cavity. If such a pulp is left without therapeutical treatment, there occurs either an acute inflammation involving the whole of the organ, or, in case the pulp-cavity is largely perforated, the process may become chronic.

Inflammation of the whole pulp is characterized by very intense throbbing pain in the tooth, intermitting in the beginning, but soon becoming continuous, and which may last from one to three days. After the first or second day of the paroxysm a little sensitiveness becomes noticeable, from pressure or percussion upon the affected tooth, indicating a beginning of pericementitis. When in this stage the pulp can be brought to view, it will appear as a dark-red dot, bulging into the cavity and bleeding quite freely.

If the exposure is large the pulp may protrude from its cavity, and, the pus which is formed escaping, the organ may retain its vitality for some time, and the inflammatory process assume a chronic form. If, on the contrary, the pulp-cavity is not perforated, or the exposure is small, preventing the swelling of the pulp-tissue out of its hard inclosure, then the vessels of the pulp, and especially the afferent vessels, become engorged with blood to such an extent that they are strangulated, resulting in gangrene of the pulp. The pain, shortly before the strangulation of the vessels, is excruciating, but only for a few minutes, and suddenly it ceases altogether.

The conservative treatment of the pulp is of great importance in teeth of young persons, especially those under the age of sixteen years, where the roots are not quite fully developed. The death of the pulp in these instances frequently terminates, sooner or later, with the loss of the tooth. It is different with teeth of adults and old persons, in which cases I do not regard the loss of the pulp as a very great injury. Though I do not want to be understood to say that a pulpless tooth is as good as one that contains a healthy pulp, still I consider it safer (when filled properly) than a tooth with a pulp which is composed mainly of fibrous connective tissue, or contains large eburnifications and spicula of bone.

I have now come to the consideration of the question, *Ought every exposed pulp to be saved? I should say, Certainly not.* As soon as the inflammation has invaded the whole of the pulp-tissue, or the formation of pus has commenced, such a pulp ought not to be treated and afterward capped, but should be directly devitalized. In a hyperemic or partial inflammatory condition of the pulp, and when the latter stage has not proceeded further than the liquefaction of the

gluey basis-substance in a small territory of the pulp, the organ can be saved, provided the pulp in being exposed has not been wounded deeply, or for any length of time left in contact with the fluids of the mouth or the air. Such pulps, in skillful hands, and with the proper treatment, will be saved every time, and are the only ones that promise satisfactory results after capping.

Regarding the use of pure carbolic acid or creasote in capping, I agree with Drs. Cravens, Barrett, A. Witzel, etc., that neither a hyperemic nor partially inflamed pulp, when its preservation is desired, should be treated with anything stronger than a five-per-cent. aqueous solution of carbolic acid. Pure carbolic acid is an irritant, and as such, when applied to tissues, excites inflammation just beneath the layer which it has destroyed,—a process which, in the conservative treatment of the pulp, should be prevented. In the capping of this class of pulps we require no other action of carbolic acid than that of a disinfectant, for which the five-per-cent. solution is ample. Some operators use this agent to destroy pulps, and in some instances I have done so myself. Therefore, pure carbolic acid or creasote ought not to be used in connection with anything that is designed to cover an exposed healthy or hyperemic pulp. In shallow cavities, however, which do not reach the vicinity of the pulp-chamber, I always apply pure carbolic acid for a few minutes before the filling-material is introduced. When used in this way, I regard its action as beneficial. It is a powerful disinfectant, and at the same time coagulates and mummifies the ends of the dentinal fibers. Thus the irritation of a metallic filling-material is greatly reduced. Whenever a cavity is large enough to admit of the interposition of cement and gutta-percha between the metallic filling and dentine toward the pulp-cavity, this protection should always be afforded. Since 1877 I have used directly upon the pulp no stronger aqueous solution of carbolic acid than the ten-per-cent., and lately only a solution of five per cent. So far as I know, all the pulps I have capped since 1880 are living,—that is, those teeth which I have seen since have given no trouble, and their appearance is perfectly normal. Their treatment has been as follows: When a cavity is deep, and the symptoms indicate that the pulp-cavity is very nearly or slightly perforated, I at once apply the rubber dam, if possible, and saturate the cavity with the five-per-cent. solution of carbolic acid. I then excavate and clean the side walls of the cavity perfectly before touching the vicinity of the pulp-chamber. If pain is produced by slight pressure with a piece of cotton upon the softened dentine covering the pulp (indicating a perforation of the pulp-chamber), I very carefully remove, with a sharp and large excavator, as much of the disintegrated dentine as possible, but

without quite exposing the pulp, and apply the cap. If upon slight pressure into the cavity the patient experiences but little or no pain, I remove all the decay from the cavity. The best material to be placed upon the dentine, either soft or hard, covering the pulp, as well as upon an entirely bare organ, I have found to be zinc oxide mixed to the consistence of thick cream with an aqueous five-per-cent. solution of carbolic acid. Over this, before it commences to dry, I very carefully place a thin wafer of gutta-percha, which, previous to its introduction into the cavity, I moisten with the carbolic acid solution. After three to five minutes, I cover the cap with either oxychloride of zinc or carbolic acid cement (Witzel*). When sufficiently hard, I use oxyphosphate or amalgam to fill up the rest of the cavity. The latter filling I always expect to remain for at least one or two years before I would consider it safe to fill such a cavity with gold.

In a former chapter I stated that, when myxomatous connective tissue is attacked by an inflammatory process, this, as all other tissues, returns to its medullary condition, from which, as long as the single medullary elements are connected with one another, a fibrous cicatricial tissue, bone, or dentine may arise. This tissue can never again return into the myxomatous condition, and consequently, in some instances, when spicula of bone or dentine are developed in the pulp-tissue, severe disturbances may occur. For this reason I advocate the devitalization of pulps the whole tissue of which has, by inflammation, either wholly or to a great extent retrograded into its medullary condition.

No doubt every dental practitioner of experience has met with patients who have suffered from neuralgic pain, which, after devitalization of a pulp or the extraction of a tooth, suddenly ceased. I have on my record quite a number of such cases, of which I will describe a few:

I. For Miss S., aged fourteen years, I filled, on the 25th of November, 1872, the second lower molar with amalgam. The cavity was

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* The formula for Witzel's carbolic acid cement is as follows:

℞ Acid. carbol., 5·0;
Alcohol absol., 2·0;
Aq. dest., 40·0;
Glycerinæ, 20·0.

Mix, and add an equal volume of the zinc chloride used in preparing oxychloride fillings. To a sufficient quantity of this mixture add oxide of zinc to give it the necessary consistence for filling.

This author also mentions a varnish composed of collodion, gutta-percha, and a little carbolic acid, which he applies upon an exposed pulp previous to the adaptation of the cap. This I have found very serviceable.

situated on the buccal, near the mesial surface, and rather extensive. The tooth, after the filling had been inserted, remained sensitive to thermal changes for a long time, but otherwise gave no trouble. In December, 1879, the tooth was decayed on its mesial surface, but in trying to prepare this cavity I found the dentine so extremely sensitive that the patient, being at the time in bad health, would not let me fill the tooth. June 3, 1880, I saw the tooth again, when the decay had reached the pulp-cavity. It had never given very much trouble, except when food, during mastication, was pressed into the cavity. I found the dentine sensitive as before, and concluded, therefore, to devitalize the coronal portion of the pulp, and made an application of arsenious acid. The next day, when the patient entered my office, she told me she felt better that day than she had for many months. When I removed the dressings and examined the state of the pulp, I found a large so-called "pulp-stone" lying in the direction toward the amalgam filling (a specimen of this you can see under the microscope). The patient, since that time, has had no more neuralgia, has got quite strong and vigorous, and the molar, with the coronal portion of the pulp amputated, does good service, and has not given any further trouble.

II. On September 3, 1881, Mrs. R., aged twenty-two, came to me with excruciating pain in the left upper lateral, containing a large gold filling in its mesial surface which had been inserted several years previously. About a year ago the patient first noticed lameness of the left upper arm, which, after some weeks, terminated in more or less constant neuralgia, affecting, at times, the whole left side of the body; but no pain was observed in this lateral previous to the 1st of September, two days before the patient applied to me for relief. I opened the pulp-chamber from the lingual surface of the tooth, and found the pulp in a high state of inflammation, which had extended somewhat into the pericementum. An application of carbolic acid, tannin, and morphia was made, which greatly relieved the patient. About one hour later I renewed the application, and after a few minutes introduced the arsenious acid paste, and then dismissed the patient, who felt greatly relieved. The next day I extracted the pulp by means of a broach, and immediately immersed it in a very weak solution of chromic acid. A section of this is exhibited in Fig. 6. The patient, who at that time lived in the country, came back two days afterward to thank me for the cure of her neuralgia, which, up to this time, has not recurred.

III. On the 1st of June, 1878, I inserted for Dr. H. an oxychloride filling in the right upper first molar, which had previously been filled with amalgam. The cavity was large, involving the distal and grinding surfaces, with half of the lingual wall broken off. On the

21st of August, 1880, I restored the last portion of the tooth with gold, but left much of the oxychloride cement over the pulp-cavity. The walls of the cavity were quite sensitive under the bur, so much so that my patient, who in all other operations I had previously performed for him never said a word of the pain produced by excavating, in this instance remarked that the drilling in some places was very painful. There had been no pain in the tooth whatever previous to the introduction of the gold, but about a week after the operation was completed the tooth became sensitive upon percussion and mastication, without signs of pulpitis. About two weeks later my patient was suffering from an alveolar abscess situated above the buccal roots of this molar tooth. I immediately tried to open the pulp-chamber, but could only go a little way into the dentine, when the patient informed me that the drilling caused him severe pain, which was analogous to the excavating of a sensitive tooth. I abstained from drilling any further, filled the small hole with gutta-percha, and began the treatment of the abscess through the gum at the buccal surface, but with no success. The abscess was continually discharging until the beginning of December, when I removed the gutta-percha, and, with a sharp drill, perforated the pulp-chamber, but, to my surprise, found the pulp alive and bleeding freely. I then, as quickly as possible, capped the pulp in the usual way, and filled the outer portion of the drill-hole, which had been widened with a larger bur up to the cap, with oxyphosphate cement, concluding to wait a few weeks longer, and then, if the abscess did not heal, to devitalize the pulp. On the 23d of January, 1881, I removed the filling, together with the cap, in order to destroy the pulp, but found that the pulp had died recently, as there was no smell of putrefaction present in the pulp-chamber. I took out a large filling in the mesial surface of the tooth, and from this situation thoroughly exposed the pulp-chamber, from which I extracted a very large so-called "pulp-stone" of the size of a small pea, occupying the neighborhood of the buccal roots. This is the specimen which I have described in chapter II, No. 4, "So-called 'pulp-stones' composed of dentine with the features of primary dentine." The canals of the tooth were then examined, and I found the two buccal canals in a very putrid condition, but the lingual canal contained its recently-dead portion of the pulp without large calcified or eburnified masses. After the disinfection and filling of the pulp-canals the abscess began to heal, and the tooth to-day is as serviceable and comfortable as any other tooth in the mouth.

A few years ago I tried to save every pulp, even after an acute total inflammation had been present, treating them with every suitable remedy, but cautiously avoiding arsenious acid. Many times

I have rather let my patient suffer a great deal of pain than devitalize the pulp in the usual manner. Such practice to-day I regard just as one-sided as to try to fill every cavity with gold and adhere to the opinion that nothing but that material will be able to save teeth from decay, and *vice versa* of other filling-material. I have experimented with arsenious acid in quite a number of cases, but am not quite ready yet to say anything about them. This, however, I can state, that so far as I know I have met with the same results as described by Witzel, namely, that arsenious acid applied upon a healthy or a superficially inflamed pulp (for from twelve to twenty-four hours), which has previously been treated with a solution of tannin in carbolic acid, does not devitalize the whole of the pulp, and when after twenty-four hours the arsenious acid, together with the destroyed portion, is removed, the remainder of the pulp, which appears to be quite healthy, can be capped and preserved. As this subject is of very great interest, I will give a very brief abstract of the method as published by Witzel in "Die Antiseptische Behandlung der Pulpakrankheiten des Zahns" (Berlin, 1879):

"Before excavating I insert a piece of spunk moistened with the carbolic acid and tannin solution into the carious cavity for a few minutes, clean the surrounding gum of the mucus-like saliva with a soft brush or a piece of spunk, and make the cavity accessible. And now I begin to clean the cavity either with broad spoon-shaped excavators or sharp oval burs. Before the introduction of the arsenious acid I make an application of the carbolic-acid-tannin solution,* until the pain in the tooth has entirely ceased, which is generally the case in five or ten minutes. The arsenious acid and morphine made into a thin paste is then laid directly upon the exposed pulp, and the cavity hermetically sealed. If the coronal portion of the pulp is to be amputated and the stumps preserved, this application should not remain longer in the tooth than from twelve to twenty-four hours. If, however, the whole pulp is to be extracted, the arsenious acid paste should remain in the tooth for forty-eight hours. Before the removal of the whole dressing the cavity must be moistened with a weak solution of carbolic acid. Then take a sharp, new bur, with the engine, now remove the last dressing, and with a few quick revolutions of the bur amputate the coronal portion of

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*℞ Acid. carbol., ·150;
Tinct. aconit rad.,
Aq. menth. pip., āā ·050;
Glycerinæ, ·020;
Acid. tannic., ·030;
Ol. menth. pip.,
Ol. caryophylli, āā gtt. xxv.—M.

the pulp, and immediately fill the cavity with carbolic acid solution until the bleeding has ceased; then place a piece of spunk moistened with the carbolic-acid-tannin solution over the amputated stumps. The amputation of a portion of the pulp is to the patient somewhat uncomfortable—about as painful as exposing a pulp. With very sensitive patients I make an application of a solution of iodine with carbolic acid previous to the amputation for about a quarter of an hour, which makes the operation painless. The whole treatment must be done quickly, very cleanly, and without exposing the amputated stumps much to the action of the air. The cavity is now to be syringed out well, dried, the stumps touched with carbolic acid, mastic, and pulp-varnish, and quickly capped with carbolic acid cement; then a layer of oxychloride and gutta-percha is placed over it, and, lastly, the rest of the cavity is filled either with amalgam, oxyphosphate, or other material."

Since December last I have tried a new remedy (iodoform), which of late has been reported as doing great wonders in surgery. The very disagreeable smell of this drug had prevented me from using it before. In a German dental journal (*Vierteljahrsschrift für Zahnheilkunde*) I noticed an article on iodoform by Dr. Julius Scheff, of Vienna, who has been very successful with it in capping slightly inflamed pulps, using it in the form of a paste, the formula of which was original with Dr. Paschkis, and is as follows:

℞ Iodoform pulv.,
Kaolin pulv., āā 4·00;
Acid. carbol. cryst., 0·50.

Mix; add sufficient glycerin to form a paste; then add ol. menth. pip., gtt. x.

I have tried this paste in a small number of exposures, and apparently with good results. I placed the iodoform paste over the exposed pulp, covering it with a wafer of gutta-percha and a layer of carbolic acid cement, and filled the rest of the cavity with either gutta-percha or oxyphosphate of zinc. None of these teeth have given any trouble since then; but in what state their pulps are I am unable to say at present. I have found another very valuable use for iodoform, in chronic alveolar abscesses. For this purpose I use the saturated solution in sulphuric ether, which, when forced through the end of the affected root into the old abscess, acts, I believe, as a very powerful disinfectant, and is therefore of great service as an application previous to filling the roots of pulpless teeth. I have also used the solution of iodoform in ether as an injection into the antrum, the mucous membrane of which was inflamed. In this case it did not quite stop the formation of pus, but prevented it longer than any of the other agents which, in this case, I had used previously or intermittingly.

APPLICATION OF THE RUBBER DAM AND SPECIAL CLAMPS, AND PREPARATION OF GOLD FOIL.*

BY MARSHALL H. WEBB, D.D.S., LANCASTER, PA.

THAT operations may be properly performed, and that gold or any other filling-material may be inserted in cavities as well as possible, it is necessary that the parts be kept dry by the use of the rubber dam. Even the vapor contained in the exhalations from the lungs, as well as the touch of a finger, prevents the cohesion of gold, which cohesion is essential to success in the insertion of all, and particularly in the making of really fine fillings. It is not only absolutely necessary for the pieces of foil to cohere in all those cases where the gold must be made solid and strength must be gained for the protection and support of enamel (frail walls of which must be incased, as it were, in gold), but when fillings are inserted in the masticating surfaces of the teeth it is also necessary that cohesion of the particles of foil be unimpaired, to prevent the scaling-off of the gold as the cusps wear away and the dentine becomes exposed by abrasion.

APPLICATION OF THE RUBBER DAM.

The rubber dam ought to be applied in every case, and it can be used in all cases, so as to exclude moisture, provided the operator has the ability to apply it successfully.

In addition to having the rubber dam applied, and particularly when operating upon the lower teeth, it is best to take the saliva from the mouth by means of Fisk's saliva ejector, if running water be at hand; if not, then a common saliva pump may be used. This is worked by the pressing of a rubber bulb placed in the hand of the patient, or operated by one who may be assisting the operator. The light-medium rubber is the best for general use, and it ought to be cut into pieces about nine inches long and seven and one-half or eight inches wide. Each piece ought to be kept for the patient for whom it was first used, and a convenient way of keeping the rubber, and the name of the patient with it, is to have a blank book made of dense blotting-paper.

The application of the rubber dam and the clamp, as well as the removal of decay and nearly the whole of the preparation of a cavity for filling, gives the patient pain, but the operator ought always to feel that he has living tissue to operate upon, and, while performing each operation thoroughly, he can and should be kind and sympa-

* The question, "How do you prepare your foil?" has been asked and other similar inquiries have been made of me so often, that I have decided to reply, in a general way, by publishing this article.—M. H. W.

thetic, and handle his patient gently. Although pressing away the gum is necessary, in order that the rubber dam may be carried to the neck of the tooth to be operated upon and be tied to each tooth adjoining, yet, when properly applied, with carefully fitted clamps

FIG. 1.*

and ligatures of waxed floss silk, inflammation of the tissue does not take place, except, perhaps, in rare instances, and in these it soon subsides.

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*Fig. 1 represents several sets of holes in a piece of rubber dam, showing how each set ought to be located for the teeth as they are to be operated upon, the sets of holes to be cut as needed at different times, and some of them made in different portions of the same (or in other pieces of) rubber dam.

All the holes ought to be made within the upper (or lower) half of the rubber dam (the center being shown by the dotted line) and at the same distance—a full inch—from the upper margin of the rubber, as shown above the holes, *a*, and they should be arranged in the manner illustrated, on each side of the center indicated by the perpendicular dotted line.

LOCATION OF HOLES FOR TEETH IN DIFFERENT PARTS OF THE MOUTH.—*a*, holes for the upper central and lateral incisor teeth; *b*, for the upper bicuspid

After selecting the proper place in the rubber dam for making the holes for the teeth to which it is to be applied in the case in hand, it should be carefully folded at that part and cut with scissors, or the holes can be made with a punch. The holes should be fully a line in diameter for the molars, or almost a line and one-half in diameter when the rubber is to be stretched over a clamp, and from half a line to the sixteenth of an inch for the other teeth (Fig. 1). The width of the rubber dam between the holes should be about an eighth of an inch, or must correspond to the space at the necks of the teeth to which it is to be applied. With the exception of the holes for the upper incisor teeth (Fig. 1, *a*) and those for the upper cuspids and bicuspids, no hole ought to be cut within about three inches of the edge, for the reason that less margin of rubber than this cannot be nicely folded and held away from the teeth to which it is attached.

Rubber-Dam Clamps.

Various forms and sizes of clamps are made for the rubber dam, the most perfect, complete, and useful of which, and those causing the patient the least pain, is the set of thirty-two (a special clamp for each separate tooth) devised by Dr. Delos Palmer, of New York. Those intended for the molars are here illustrated.

Each clamp is put in place with a suitable forceps. The clamp designed or selected for the tooth to be operated upon ought to be placed in position first, in almost every case (especially on the molars), and the rubber dam then stretched over the clamp and the tooth to which it is fixed, and at once applied to the one adjoining or to the two teeth anterior to it. As the rubber is stretched over each crown, the floss silk must be passed between the teeth to carry down the part that separates the hole for one tooth from the one for the other. In most cases the rubber should be carefully tied to each tooth to which it is applied. Where there is danger of cutting or tearing the rubber dam and floss silk, while placing them between the teeth, the sharp, irregular edges of enamel surrounding the cavity within

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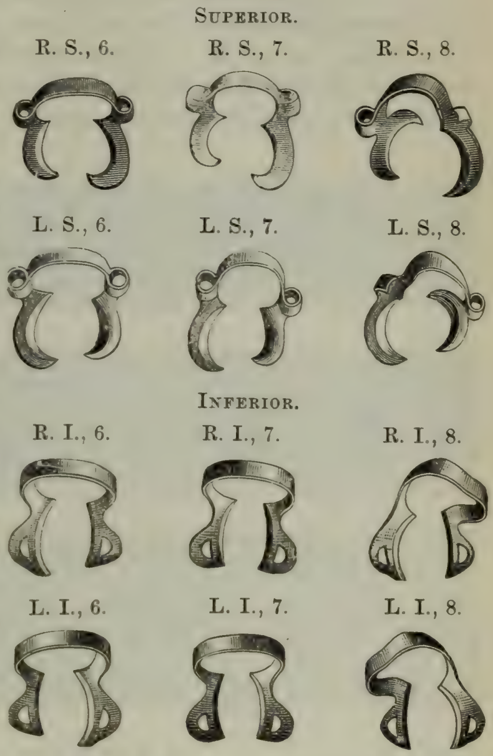
teeth and first molar, left side; *c*, for the upper bicuspids and first and second molar teeth, right side,—one hole additional to be made just back of these, if the clamp and then the rubber is to be applied to the third molar; *d*, position of the holes for the lower incisor teeth; *e*, for the lower bicuspids and first molar, right side; *f*, lower left bicuspids and first and second molars;—the + indicates the position for holes for the other teeth.

While the holes in their general arrangement are shown full size, the rubber cannot be illustrated as large as it ought to be. It should be seven and one-half or eight inches wide (counting from the line above the holes, *a*) and nine inches long,—four and one-half inches each way from the perpendicular dotted line. The holes for the second upper bicuspids are too large in the cut.—M. H. W.

the approximal wall of either tooth ought to be removed with a fine ribbon-saw, passed from the masticating surface to the neck of the tooth. Clamps need be applied in but few cases other than to the molar teeth.

Fig. 2.*



The rubber dam ought to be applied to a sufficient number of teeth to have the tooth to be operated upon accessible, although it is scarcely necessary to apply the rubber to but three or (rarely more than) four teeth, even when cavities within the approximal walls are to be prepared and filled.

The edges of the rubber ought to be carefully folded or nicely placed back upon the side of the face, and held out of the way by a rubber-dam holder, and, for the comfort of the patient, a fine, soft napkin should be put under the rubber next the lips, chin, and cheeks.

Preparation of Gold Foil.

In the preparation of gold for the various operations required, a half-leaf of light gold foil for small (or the smallest), a whole leaf for medium, and two leaves for large fillings, should be taken from the book by means of a spatula or the foil-carrier, and placed upon a piece of spunk covered with white kid. The foil should then be smoothly folded with an ivory or nickel-plated spatula into a tape-like form of

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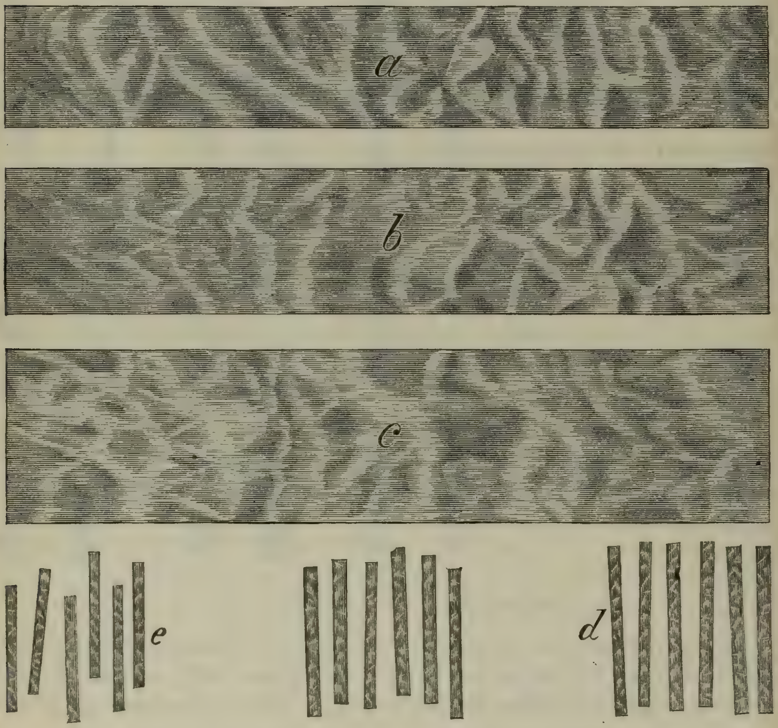
* A special clamp, designed by Dr. Delos Palmer, for each separate molar tooth is here shown (Fig. 2). The letters and numbers signify that R. S., 6, for instance, is intended for the *right superior sixth* tooth (first molar), counting back from the median line. The "Universal Screw-clamp," devised by Dr. Parmly Brown, is an excellent appliance, also, and many more of the clamps and other appliances which have been made should be mentioned, but it would be too much of a task to refer to the merit of each and to name the credit due the inventor.—M. H. W.

about seven, nine, or eleven lines in width (Fig. 3, *a*, *b*, and *c*, thus making Nos. 12, 20, and 32—if the foil be No. 4) respectively, then taken up with the foil-carrier and cut across into pieces about a line wide (*d*). For some cases, such as the filling of pulp-chambers, the pieces of foil ought to be less than a line wide (*e*).

As these pieces are cut from the ribbon they should fall upon the kid covering the spunk or upon very fine linen napkins. Each of the pieces of foil can afterward be readily taken up with light-pointed foil-carriers or the packing-instrument and passed over the

Fig. 3.



flame of alcohol till the piece has a rose-tinted shade or is made cohesive, when it must be put in place at once and solidified.

Heavy foil, such as Nos. 30, 40, and 60, cut into the same sized pieces as folded foil (Fig. 3, *d*), can be used to advantage in most cases, especially in extensive restoration of contour of missing tissue, although light foil, when prepared as just described, can be more easily inserted in small cavities, fissures, and grooves.

When prepared in the manner described, each piece of foil can be readily introduced, folded over and again upon itself, and each fold separately solidified. The operator can be certain of these conve-

nient narrow pieces remaining firmly anchored in the starting-point, and each additional piece readily adheres to, and is easily made compact with, that already in position, thus making the whole filling uniform in density. Each piece of foil should remain in the position in which it is placed, and when the pieces are prepared as described the form is such that they can be put in place in all classes of cavities conveniently and with certainty.

The abuse and not the use of cohesive gold has led to its condemnation, but they alone condemn it who have not prepared and manipulated it properly and successfully.

Foil should always be prepared in the manner stated and be used in the form illustrated, and all gold ought to be cohesive, particularly when a mallet is used, so that the particles or the pieces may surely and permanently remain together. There is no other method by which gold can be made so solid and so uniform in density, with such ease, certainty, and rapidity, as with the electro-magnetic mallet, but it ought always to be well adjusted, the battery should be properly attended to, and the instrument must be operated understandingly.

A GENERALIZED TREATMENT OF IRREGULARITIES.

BY WALTER H. COFFIN, F.C.S., F.R.M.S., M. PHYS. S.

(A paper read before Section XII. of the International Medical Congress, London, August 8, 1881.)

The possibilities of regulating are known, but on any case of irregularity presenting for treatment the practical question will be, What is the best to do, and how is the best to do it? A classification and analysis, in even their infinite variety, of a sufficient number of instances, and the results of their treatment by every possible means, should afford at least an approximate answer to these, and the no less important questions,—what not to do, and how to avoid doing it?

A few models shown have been selected, as fairly representative, from a collection of several thousand, recording the attempted treatment of perhaps a larger proportion than usual of the ordinary irregularities met with in an average practice, and—as extending over more than twenty-five years—illustrating the evolution, within certain limits, of an almost generalized method.

A peculiar system thus developed, in use for many years, is no longer a novelty; but having been imperfectly made known (for which perhaps its advocates are responsible), and a misconception existing as to its real objects, those in whose hands it has been an

invaluable aid feel that some account of what they conceive to be its capabilities and limitations may not be unwelcome.

Classifying any large series most conveniently by the mechanical exigencies of each case, in certain of them extraction of possibly sound teeth may, of course, be necessary,—though these are less numerous than usually imagined,—a possible alternative in many instances affording (as shown by casts submitted) satisfactory results.

A large class, uncomplicated by crowding, in which aberrant teeth are easily replaced, admit of direct and immediate correction by suitable means (a simplification of which will be alluded to).

Of the remainder, the majority are cases of every variety, in which the teeth—not really too large or too numerous for the jaw they might symmetrically occupy—are, by some chance of their eruption, irregularly disposed, interlocked, and crowded. Of these it may be affirmed, quite generally, that rectification necessitates the movement of many teeth or all, and an altered shape or outline of the dental arch; for any attempted direct adjustment of individual teeth will be accompanied by such a disturbance, more or less extensive. These present the greatest difficulty in regulating by the usual way, especially with a rigid plate; but in the most intricate or the simplest of them, the permissive control of the general tendency of movement during regulation reduces their successful treatment to comparative ease and certainty. This mechanical *anticipation* of favorable conditions may be illustrated by assuming an incisor to be moved in a crowded arch by any means applied by a plate rigidly embracing the bicuspids and canines, when a certain force in a certain time may complete the operation; but were the plate either abolished, or its symmetrical halves partly independent and free to move relatively in the plane of the arch, less time and force would suffice; and, furthermore, if its halves tend but slightly to separate by an elastic spring reaction, many cases will require very much less time and force to be exerted on the tooth. The action thus stated in its simplest form is obvious from *à priori* considerations, but was observed, it is believed, for the first time by a singular accident.

Soon after the introduction of vulcanite my father was employing a plate of that material to move an incisor by the swelling of wood. Successive increments of force were resisted until not only was it suddenly in position, but other front teeth were found slightly separated where previously in overlapping contact, the wood (being nearly on the median line), by lateral expansion, having split the plate down the center. In this instance, as will often be the case, previous "expansion of the arch" by the means usually applied was certainly not indicated, and therefore not resorted to, although just

the slight amount of spreading required was prevented by the rigid construction of the plate A conviction of this led to a particular method of treating various irregularities, which, as anticipating changes common to them,—usually expansive,—has been called, somewhat indefinitely, an "expansion treatment;" and whose adoption has been abundantly justified by experience.

The troublesome and delicate operation of "expanding the arch," as usually performed, if attempted by the ordinary "jack-screw" direct, must be accomplished before other regulating action can generally be commenced, and may then prove to be either excessive or unnecessary. The screw is applicable, with care, to severe contraction (though inferior to other means); but undivided plates, however thin and elastic,—or hinged plates, however actuated,—have not the freedom of movement and adjustability desirable; and the screw is entirely unsuitable for a split plate.

The little device my father calls an "expansion plate," whether used for direct expansion or not, is intrinsically of extreme simplicity, while of complex regulating action, comprising a means—easily embodied in any plate—of conveniently permitting or assisting (instead of hindering or preventing) during regulation, the inevitable changes of the arch naturally accompanying it, and supplementing ordinary expedients with an expansive characteristic. Its distinguishing function depends on the principle of permitting a relative motion, or maintaining a particular controllable reaction, between two semi-independent parts, usually its symmetrical halves.

If required, any force, however small, is sufficient, if exerted continuously over a certain distance, with not too rapidly diminishing intensity. Mere repulsion, however, between two points on a split plate, is an unstable system, and uncontrollable. Allowing a certain freedom of motion, means must be provided for restraining it, and maintaining by a yielding guidance any desired degree of parallelism.

Difficulties attended the first realization of these conditions; but it is found that a wire spring of certain form, if a constructive part of the plate, will itself meet all requirements.

Modifications of the arrangement found most convenient and satisfactory are exhibited,—after actual use, and in different stages of construction.

The general form* may be described as a rather thin vulcanite plate, capping and clasping some or all of the bicuspids and molars, and fitting the lingual surfaces of anterior teeth, but divided along the median line into two distinct halves, connected, however, by a

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*See Coleman's Dent. Surg., 1881, pp. 63, 64.

slight steel wire, so disposed that, while guiding and limiting their relative motion, its tension exerted between them may be perfectly determined and varied in direction and magnitude.

When necessary in such a plate to establish the spring reaction, a surprisingly small, almost imperceptible *stress*, even so distributed, and against a widespread resistance, if continuously maintained and suitably applied, suffices to produce any degree of motion desired.

The perfection of the model must be insisted upon, as an *entire* plate may fit well and securely, and yet both its halves be so loose when *divided* as to be useless; while, on the other hand, the halves of a split plate may be easily fitted, which before division could not possibly be inserted. The best impressions have been obtained with the preparations of gutta-percha or ballata gum, no other material affording with ease the absolute fit essential for a split plate. Their physical property (when in good condition and at the right temperature), of being elastic and recoverable to rapid changes, reproducing, if inserted slowly and removed quickly, the most intricate undercuts just sufficiently—and affording by the slight contraction in cooling just enough shrinkage—for a thin hard-rubber copy to fit tightly. A delicate and elastic vulcanite plate from a good gutta-percha impression—if the model be vulcanized upon direct, and not touched to accentuate undercuts or correct imperfections—will generally spring over the teeth with so absolute a fit that its removal may even be embarrassing; but until divided its insertion is not usually attempted.

Trials of the metals and their alloys proved the superiority for springs of apparently so undesirable a material as steel.

The almost insuperable difficulty of satisfactorily tempering bent soft steel without deformation of shape was obviated by the use of pianoforte wire, as possessing very uniform texture, temper permitting it to be fashioned and used without heating, and a surface hardness and burnish which greatly tend to its preservation. To coat this wire with other substances was found unnecessary and undesirable. The behavior of steel to the fluids of the mouth is such that, if hard and bright at first, and continuously immersed in average saliva, it generally assumes a black polished surface, the smooth, fairly-adherent tarnish being apparently insoluble. A diameter of between three- and four-hundredths of an inch (about 0·035 inch) is most suitable, as of this a convenient length of from one to two and a half inches exerts an appropriate tension in average cases. The force—varying inversely as the length—may be thus determined within those limits, beyond which a different size is required.

The extremities being buried rigidly in the vulcanite, the uncov-

ered and active portion of the wire emerging from selected points in the alveolar region should be entirely on the lingual side of the plate, nicely fitting, but free to move upon its surface. The wire between its attachments may be in a simple curve, when, for localized action (as exclusively posterior expansion), it will urge a relative motion or rotation about some point; but, that every kind of motion may be established, there must be one or more reversals of curvature, by either a single couple of opposite curves, or any number of alternately contrary ones (preferably *odd*), approximately balanced, and as large and symmetrical as possible. Small bends or angles being avoided, the disposition of the wire may otherwise entirely conform to its most convenient adaptation to the particular plate. A serviceable form for an upper general expander is a three- or five-curve serpentine figure, like a rounded capital W.

The spring being shaped to fit as nearly as may be the palatal surface of an upper model, or the lingual surface of a lower, has its ends for half an inch (without being softened) slightly flattened and roughened, and so bent toward the model as to raise it uniformly from the surface to a distance of about the desired thickness of the plate, and the portion to be inserted in the rubber tinned or coated with common solder. To several points upon its exposed part short ends or loops of binding-wire are twisted to better secure it in the plaster investment. When in shape, it must be free from tension, and attached in the vulcanization to the plate, which is made *entire*, and afterward divided.

The plate being modeled in wax, the spring is placed on the surface, with its ends buried within, and when removed by the counterpart, protected from the rubber by tin foil before packing. Finished in the usual manner, entire, the plate is divided with a fine saw, the edges and corners of the cleft being well rounded and smoothed. This, with care, may be done without imparting tension or twist to the spring, which is important.

The plate should be inserted and worn in the mouth without tension for a day or two, to first eliminate causes of irritation not due to its expansive action, and sooner induce toleration of its presence. Any expansive force required may then be established, and its right direction secured, by stretching the two halves with a slight exaggeration into the relative positions toward which it is desired they should tend to move. This, however, may require correction and modification by observing its effect in the mouth. The amount of stress, which is not so conveniently diminished as increased, should be small at first, especially in plates whose expansive function may be simply permissive or auxiliary to other regulating action. It may safely be intrusted to the patient (even quite young) to fre-

quently remove, clean, and replace, after duly cautioning, without fear of disturbing its adjustment.

The experience gained of steel wire has led to its almost exclusive adoption for ordinary regulating purposes, as spring levers acting directly on the teeth, for pulling, pushing, or rotating; and, being permanently fixed to the plate, their convenience, adjustability, and many adaptations, are remarkable. Combined with a split plate, they are found to replace, with advantage, screws, inclined planes, wedges, levers, and ligatures, in many of their local uses; and, moreover, are practicable where nothing else can be applied. In fact, by the gradual simplification of means, and the elimination of uncertain devices, a delicate split plate, with one or two short lengths of small wire closely fitting its surface, is often now, to those who employ it, the representative of the wondrous combinations of nearly all the known "mechanical powers" that once exercised their ingenuity. Where in simple cases a plate is unnecessary, with an inch or two of steel wire and elastic rubber tube, efficient expedients may frequently be improvised.

When direct expansion of the arch is indicated, the thin spring reaction plate, fitting closely the palate, teeth, and tissues covering the alveoli, and not filling the mouth or impeding its functions, will, with the minimum of trouble and attention, effect any desired degree of that spreading and molding of the mouth which it is well known may, to a surprising extent, be rapidly and almost painlessly produced. So easily is this done that caution must be observed not to inadvertently exceed the intended results, and the temptation to so readily make room for crowded-out teeth, though often with gratifying effect, must sometimes be resisted. Indeed, the extreme facility and rapidity of general expansion by the split plate has, in the hands of some without experience of its limitations and abuses, been to the prejudice of the method.

Among the uses of direct expansion, its interesting application to the operative treatment of caries, and to slightly overlapping incisors, may be discussed together.

In young mouths where interstitial decay of incisors closely in contact almost defies successful treatment, any operation attempted, whether of separating surfaces, shaping or filling cavities, or restoring contours, will, of course, be facilitated by gaining ever so small a space between them. Paradoxical as it may seem, it is actually less painful and troublesome to secure ample spaces between all the front teeth at once, than to wedge two of them apart in the ordinary way; with the advantage of easily maintaining their separation without irritation during any course of treatment.

A plate exerting anterior expansion will rapidly—and usually

almost painlessly—separate the incisors, and, by a suitable adjustment of the bearing surfaces, may readily be caused to distribute spaces equally between all the front teeth. Their slight tenderness soon disappears if held by the same or another plate, and they may be kept apart without fear of their not coming together again. In nerve-inflammation, caution will suggest itself; but an accident has not occurred from that cause. If the incisors are just overlapping, slight expansion, with suitable disposition of the bearing surface afterward, usually permits the natural action of the lips to straighten them.

In some of these cases it may be necessary to partly maintain the expansion of posterior teeth by a suitable retaining-plate, exposing their articulating surfaces till the bite is readjusted by those of the other jaw accommodating themselves. Where expansion in one jaw is considerable, the bite may require a slight mechanical expansion of the other, which, for this purpose, and assisted by the articulation itself, is easily attained.

Expansion, where posterior teeth wrongly articulate, presents little difficulty when the conditions are symmetrical on both sides; when otherwise, or confined to one side only, a differential or even a unilateral effect may be produced, according to the number and kind of teeth the action of the plate is distributed or concentrated upon, and the arrangement of its articulating surfaces. In differential expansion (which may occur unexpectedly) the relative motions appear disproportional,—that is, seem to vary (inversely) *more* than the estimated resistances.

Lastly, the obvious application of the divided spring plate to narrow, mis-shaped mouths with high, contracted roofs, unfortunately also presents considerable difficulty. These cases admit of very great improvement (as illustrated by models exhibited), where circumstances are favorable for expansion: as when the bite can be either kept normal or made so, and the jaw is not really so contracted as the dental arch makes it appear; for such the split reaction plate is peculiarly adapted and unsurpassable, if used with caution.

In several cases accompanied by prominent incisors, after only slight posterior expansion, considerable spontaneous recession of the incisors has occurred, probably by the action of the lips, before special mechanical means were employed.

In the models of many cases treated will be observed the profound alteration in shape the palate vault appears to have undergone. Inflammatory symptoms observed along the median line, corresponding to anatomical relations (possibly caused by the edges of the cleft plate), have suggested certain bone-disturbances; but

though the extensive changes seem otherwise almost inexplicable, inter-osseous action can only be conjectured.

While expansion is most readily performed in young mouths, especially under sixteen, the only limitations of age would seem to be the diminished power of restoring fixity after movement, which must be inferred of advanced age; though in a case of considerable expansion at forty-five the teeth became perfectly firm afterward.

It is hardly necessary to dwell on the desirability of the greatest possible simplicity of regulating devices, in principle and details; and the self-maintaining adjustability of plates, that they may be as independent as possible of any control by the patient, whose co-operation should be confined to their perfect cleanliness only, and the health and comfort of the mouth. But it may, perhaps, be pointed out that greater beauty and finish of plates than is customary is not without effect in assuring care and attention to their good condition.

Great credit is due, for working out certain details of expansion plates, to Mr. Peter Headridge, of Manchester, for many years assistant to my father. This gentleman even obtained a patent for some constructive particulars, which, however, he very advisedly abandoned. The curious are referred to specification 1101, 1869.

In final justification, the advocates of a method they find to simplify, and trust may extend, the treatment of irregularities appeal to their record of results, which—of whatever real importance or value—would have been difficult or impossible to otherwise attain; and have ventured at such length to detail their procedure, for confirmation or criticism by others.

The paper was illustrated by more than five hundred old regulating-plates which had been actually used, about four hundred being "expansion plates," upper and lower, symmetrically and unsymmetrically divided, of which nearly two hundred were "simple expanders," some two hundred embodying other regulating devices with "expansion;" the remainder showing the application of pianoforte wire in ordinary plates for general regulating purposes.

There were also specimens, with demonstrations, showing at different stages details of their mode of construction.

The models exhibited in the Museum of the Congress, at Burlington House, of forty typical cases (recording by three or more casts to each the conditions before, during, and after treatment), were classified as illustrating—

1. Expansion auxiliary to ordinary regulating.
    (*a*) In simple crowding.
    (*b*) For rotation and alignment.
2. General expansion.
    (*a*) For operative treatment of caries.
    (*b*) For mis-articulation.
    (*c*) *Versus* extraction of misplaced teeth.

(*d*) For prominent incisors.
(*e*) For contracted, narrow, or mis-shaped arch.

3. Applications of steel wire to every kind of ordinary regulating.
    (*a*) Alone, without plate or accessories, for alignment or rotation.
    (*b*) Combined with elastic ligatures.
    (*c*) With an ordinary plate for moving, shortening, lengthening, and rotating teeth.
4. Combinations of the above.

PROCEEDINGS OF DENTAL SOCIETIES.

AMERICAN DENTAL ASSOCIATION—TWENTY-SECOND ANNUAL SESSION.

THE twenty-second annual session of the American Dental Association was held in the hall of the Highland House, Cincinnati, commencing Tuesday, August 1, 1882.

FIRST DAY.

The association was called to order by Dr. H. A. Smith, president. After prayer by Dr. W. H. Morgan, an address of welcome on behalf of the dentists and citizens of Cincinnati was delivered by Dr. A. Berry, which was responded to by Dr. W. C. Barrett.

The morning session was devoted to routine business, the most important of which was the adoption of the amendment to the constitution offered by Dr. Shepard at the last meeting, giving the officers power, for extraordinary reasons, to change the time and place of meeting upon the written consent of ten of the fifteen officers.

The death of Drs. M. S. Dean, of Chicago, and D. C. Hawxhurst, of Battle Creek, Michigan, was announced, and committees were appointed to prepare appropriate resolutions. The secretary was directed to forward a telegram to Dr. Marshall H. Webb, of Lancaster, conveying the sympathy of the association in his illness.

At the opening of the afternoon session the president read the annual address:

Referring to the importance of exact information regarding the etiology of dental caries, the president suggested that the association offer a money prize for the best paper, based strictly upon original investigation, relating to the etiology of dental caries; the award to be made and announced at the annual meeting in 1884. The address also considered at some length the subject of dental education. The resolution adopted in 1880, insisting that the dental colleges, in order to secure representation in the association, must require from all students attendance upon two courses of lectures,

had been protested against by men whose opinion we cannot afford to regard lightly as having an "air of dictation not authorized by the power of this association." "The adoption of a line of policy in reference to educational matters, methods of practice, or, indeed, in any direction, that partakes in any degree of a dictatorial spirit, it must be evident, is unwise, and must have a reactionary effect." The attempt of the American Society of Dental Surgeons to dictate to its members the modes of practice they should pursue, which ended in the dissolution of the organization, was cited as evidence; also, the numerous efforts, without any apparent good result, of the American Medical Association to improve the system of medical education and raise the standard of requirements for the medical degree. "The first medical colleges were established previous to the Revolution, and now, after the lapse of more than a century, of the hundred and upward of medical schools in this country, not more than half a dozen have adopted the advanced or graded system of instruction, and a three years' course as a requirement for the degree. The whole system of dental education of to-day, in the United States, as represented by the sixteen colleges or departments, situated in ten different States, with their eighty professors aiding in the instruction of over eight hundred students, has been developed within a period of forty years. In this comparatively short time it is hardly to be expected that a uniform scheme of tuition, or of time-requirement, should have been adopted in all the dental schools; especially when we recall the fact that not more than one-third, perhaps, of those who enter upon the practice of dentistry each year receive any other training than a limited pupilage with a private preceptor in a dental office. * * * Considering the facts I have mentioned, together with the other significant fact that a majority of those who are now in the practice of dentistry in the United States have no degree, either in medicine or dentistry, we have every reason to congratulate ourselves that dental education occupies the advanced position which it does. In bringing about these encouraging results our social society organizations have been largely influential, and, since our dental schools receive their material and moral support from the profession, it is of the highest importance that the power which this and similar organizations have, in creating and directing professional sentiment and indirectly enlightening the people in regard to the necessity of thorough special training on the part of those who hold themselves out as competent to treat dental ailments, should be judiciously exercised."

The Sections were called for reports, and Dr. W. H. Atkinson, of Section III., Dental Literature and Nomenclature, read a paper on "Terminology," which was a continuation of the reports of former

years, and was devoted principally to the discussion of the application of the principles of the universological nomenclature to biological science and the classification of its branches and subdivisions under their Alwato (the name given to the universological language) names.

After a long discussion as to the proper disposition of the report, it was referred to a special committee of five, which recommended that it be referred to the publication committee, as its predecessors had been; that, inasmuch as its subject-matter was applicable rather to general science than to dentistry, if the association wished the subject to be further presented, a section on philology should be established. The report of the committee was adopted.

SECOND DAY.—*Morning Session.*

Dr. Goddard offered a resolution, which was adopted, requiring the treasurer to give bonds in such sum as shall be required by the executive committee, and to deliver the money, books, and other property of the association in his possession to his successor only on notification from the executive committee that the proper bond has been executed.

Section IV., Operative Dentistry, was called, and Dr. E. T. Darby, chairman, read a report, submitting a paper entitled "Some Thoughts on Regulating Teeth;" also calling attention to Coffin's method of correcting irregularities by means of split rubber plates and pianoforte wire: and suggesting the desirability of a thorough discussion of the various new methods of ingrafting artificial crowns upon natural roots.

Dr. W. N. Morrison, St. Louis, Mo., read the following paper, entitled "Some Thoughts on Regulating Teeth:"

I have been very forcibly reminded, lately, of the numerous errors continually committed by old and otherwise respected practitioners, and earnestly defended and imitated by their pupils or students, in the extraction of the sixth-year molars for so-called regulating purposes, it being claimed by them that complete success crowns their efforts in every instance. I very much lament that so much stupidity exists in the profession to-day, that the mistakes cannot be seen by looking at the articulation of any set of teeth, and the facial expression, where such extraction has been performed. It is a rare treat, at this day, to see a perfect arch with a correct articulation. These matters have become so much of a study with me, that when I see persons in the street I can nearly always tell when they have met the irreparable loss referred to before looking into their mouths.

It is with joy that I welcome all helps to the correction of irregularity. In our text-books and journals there are complicated and labored diagrams and descriptions of appliances, but it is very obvi-

ous that "the gigantic intellect does not come to the rescue" in them.

It is the same with fillings. Many operators will put in a simple filling in the crown of a molar and grind down the cusps, and even the enamel ridges, to show off the filling to the best advantage; showing the work in a mirror to the simple-minded patient, who does not realize, until after years, the damage he has sustained.

The idea that continual extraction has no hereditary influence is absurd and ridiculous, though some dentists, in order to convince and console patients for the loss of their teeth, or those of their children, bring up the old story of the cutting-off of sheep's tails having had no influence upon the length of the lambs' tails at the present day. My experience is that hereditary contracted jaws are the most difficult to correct of any we have to treat.

During the whole course of my professional life I have only made one mistake in regulating teeth. In that case the patient never developed to normal size; small in stature, diminutive in physique, with large, good teeth in a small mouth, I am free to admit that she would look a little better with that part of her anatomy less prominent. But look at the thousands of cases at the other extreme. The public are clamorous for deformed mouths! The first demand is to have all the natural teeth extracted and full sets of artificial, little, narrow, white teeth inserted; second choice, about the half of their teeth extracted to improve the appearance of the rest and keep them from decaying; and, thirdly, to have the crowns of the remaining teeth horribly mutilated by filing and grinding. It is a disgrace to the profession that there are so many claiming to be progressive dentists, who accede to such demands and practice to the requirements.

A few months ago the public and a few silly snobs, through the press, went into ecstacies over a great singer's small mouth and beautiful teeth. In reality her mouth was a deformity; teeth irregular, one canine so much out of the arch that when she cast a bewitching smile her lip sometimes caught upon it, and it was with some difficulty she could get it down. Her profile had that sorrowful, dinged-in appearance so common at this day.

Several years ago the papers gave an account of the selection of a characteristic American female head, by the designer of our new silver dollar, that should accurately represent the correct type of American beauty. I do not know the lady, nor her dentist, nor have I had any information with regard to the condition of her teeth or articulation; but, seeing her face upon the few dollars which have passed through my hands, I will venture the assertion that her mouth does not contain thirty-two normally-formed teeth.

In the treatment of cases the great difficulty is to control the patients and parents. In many instances the parents give up long before the child, and say they will have no more to do with it; they would rather see crooked teeth than see their children undergo so much suffering,—nearly all of which suffering was occasioned by changing the application of the apparatus when the teeth were at their most painful state, for the purpose of cleansing plates or changing direction of force.

Teeth are very easily moved if the force be applied in the right direction, but they as easily return to their old places if the force be too early removed. That is my objection to all of these complicated apparatuses, and is entirely obviated by my system of regulating with screws and levers and rubber ligatures, which are secured to the teeth by thin, annular bands or ligatures of platinum cemented to the teeth with oxyphosphate of zinc, where they remain until the operation is entirely completed. Platinum can be carried between teeth in the most crooked condition, with no more force than would be required to carry a strand of floss silk.

There are no better forces than the old-fashioned screw, lever, and wedge. What we want is the secure application of them, and with this any case can be speedily corrected. In the application of the jack-screw I solder the socket end to an annular band; having selected a tooth in the required position from which to exert force in a right line upon the tooth, I use a similar band, soldering to it a little boss to receive the free end of the jack-screw, which prevents all cutting or other injury to the natural tooth, so that when the appliances are removed the teeth are smooth and uninjured. When I wish to rotate a tooth upon its own axis I use an arm about one-half inch long, with a hook upon the end, soldered to the band projecting from the palatal surface. After the cement is sufficiently hardened, I apply a rubber ligature to any tooth which will exert the force in the right direction. All my fixtures increase the size of the tooth but a mere trifle, and they are tolerated by the tongue with but little inconvenience. I frequently use as many as four jack-screws and several levers in one mouth at the same time. In nearly all cases, if the arches are sufficiently expanded, the teeth will assume their own positions and regulate themselves. Regulation should nearly always be done by expanding the arch, and seldom by contracting.

When a case is completed, I construct a retaining apparatus in a similar manner; securing a bar upon the labial or lingual surface, as the case may require, soldered to platinum ligatures, or bands, which are cemented to the teeth and worn for weeks, months, or years,—if a case should require it,—permitting a perfect cleansing of a tooth

upon all surfaces except those parts under the cement, which could not be subject to decay.

Dr. Atkinson had never heard a paper of the length of the one just read which contained so much of real truth, but there were some assertions made which he must combat. He could not agree that the screw should ever be used to move a tooth; there were other means of applying force which would produce the result without causing the irritation which the screw was liable to set up. That the force must be applied in the direction in which you wish the tooth to move is true. It does not require a year to move a tooth when the proper method is adopted. He has numerous specimens of practical regulating cases, in which from thirteen days to two months was all the time required to move teeth in patients thirty years of age. If you have such an appliance as will bring the force to bear only on the teeth which are to be moved, while those which are to remain stationary are kept from its influence, there will be no difficulty about causing mal-occlusion of the teeth. The next heresy in regulation is that the teeth should be moved a certain fixed distance by turning a screw each day. After the teeth have been made to assume their proper places, in the majority of cases they do not need even a silk ligature to hold them there; the resilience of the lips and the occlusion of their opposing teeth will keep them in position.

Dr. Atkinson showed specimens illustrating his method of regulating, which he described. An impression of the mouth is taken, upon which wax is built to the proper form, covering the teeth which are not to be disturbed, and a plate is then made of the Reese cast-gold alloy, to which is fastened a thin band of platinum and iridium, passing around outside of the arch at the proper distance from the plate—the distance must be regulated by the necessities of the case. Holes are drilled in the band for the attachment of rubber bands or rings, which, being passed over the teeth to be regulated, draw continually, and quickly bring them into the proper position without causing disturbance. You must not send your patients away with watch-keys to exercise their lack of judgment in place of real judgment. [One of the specimens shown was an appliance that had moved eight upper front teeth in the mouth of a man thirty years old in thirteen days. Another was applied on the 30th day of May and was taken off on the 12th of July, having accomplished its work perfectly.]

Dr. Atkinson contended that the method he showed was *the* method for regulation.

Dr. C. N. Peirce, Philadelphia. We cannot make a cast-iron rule by which to regulate the teeth; we have to make our appliances to

suit our cases. The screw will undoubtedly regulate some cases with less irritation than any other application that can be made. At the same time, there are many other cases in which its use is not the best method.

Dr. L. D. Shepard, Boston, would like to ask Dr. Atkinson what provision was made to secure cleanliness. Was not this appliance which accomplished its work in six weeks removed for cleansing during that period?

Dr. Atkinson. Never once.

Dr. Shepard. Were the same rubber bands used during the whole time?

Dr. Atkinson. The same elastics, except two which broke.

Dr. Shepard thought that any appliance for regulating teeth which was so made that it could not be removed to be cleaned was not properly made. It seems clear, to his mind, that cleanliness is one of the most important points to be kept in view. A plate for regulating can be so made that it can be readily removed by the patient after each meal for cleansing. His criticism of Kingsley's "Oral Deformities" was that in the description of some two hundred cases of irregularities corrected only about three lines were devoted to cleanliness. It seems to him that neglect to secure proper cleanliness in such cases is very dangerous to health.

Dr. Atkinson denied that it was necessary to remove a plate while correcting an irregularity to secure cleanliness. All that was required could be accomplished by means of washes.

Dr. H. J. McKellops, St. Louis, described two methods of regulating which had impressed him favorably. The first was Coffin's split plate.* While in London last summer, in attendance on the sessions of the dental section of the International Medical Congress, the speaker had a plate made for his son (a boy of twelve) by Dr. Coffin; the irregularity consisted of a mal-position of the lateral incisor, which was inside the arch. Fig. 1 shows the appliance used in this case. During their journey across the ocean homeward the patient removed the appliance whenever it became desirable and readjusted it himself, and by the time they reached the United States—some nine days—the misplaced tooth was brought into position. While in London Dr. McKellops saw the models and apparatus of over two thousand five hundred cases in which Coffin's split plate had been successfully used to overcome all forms of

* Inasmuch as Dr. McKellops's description of Coffin's method of regulation was very favorably received, we reprint, at page 463 of the current number, the complete text of Mr. Walter H. Coffin's paper read before the section on Diseases of the Teeth, of the International Medical Congress, a synopsis of which appeared in the DENTAL COSMOS for November, 1881.

irregularity. Some of these he had obtained, and brought them with him for the examination of the members of the association. The models shown exhibited different forms of the appliances for correcting various irregularities, with the special tools required for making them. Nearly every irregularity requires for its correction the spreading of the arch, and it is for this purpose that the split plate and piano-wire in the shape shown are used. Special teeth to be moved or rotated are acted upon by other wires fastened in the plate in such position as is required by the exigencies of the case. The method was so simple and adapted to so wide a range of cases that there was scarcely a phase of irregularity in which it could not be used. The whole working of the apparatus rests upon the elasticity of a piece of piano-wire. Every part of the work of adapting an appliance after this method must be carefully done, to insure its successful working. After this the patient may be safely intrusted with its management. In taking the impression the greatest care must be observed to make an absolutely perfect fit. For this purpose gutta-percha is used. Two bowls are provided, one of which is filled with hot water, the other with cold. The gutta-percha is placed in a suitable impression-tray. The tray is perforated at different points to better retain the material, which is softened in the hot water, and then placed in the cold water for a moment to chill the surface, so as not to cause discomfort to the patient; it is then placed in the mouth, and the patient is directed to bite upon it. The removal causes some little expansion, but this is counteracted by immediately placing it in the cold water, and keep-

Fig. 1.

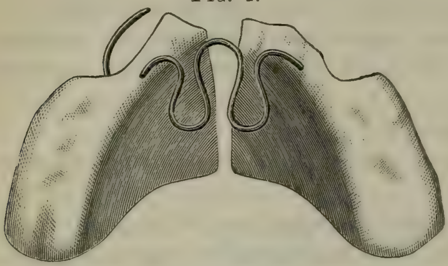
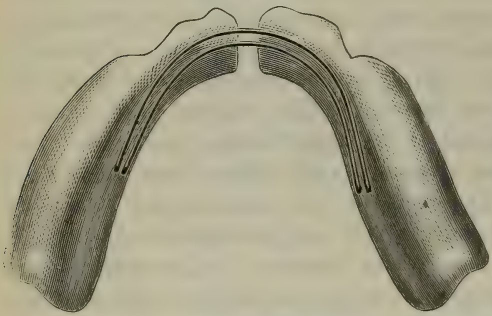


Fig. 2.



Figs. 1 and 2 are typical appliances for the upper and lower jaws. The wire in Fig. 1 shows the form best adapted for expanding the anterior portion of the arch; that in Fig. 2 the form adapted to enlarging the posterior portion. The additional wire on the left of Fig. 1 was used in the case above mentioned to force the lateral incisor outward.

ing it there till cold; a small glass rod is laid in the cold-water bowl upon which the tray rests, thus preventing the gutta-percha from adhering to the bowl, so that the result is in nearly every case a perfect impression,—the best for the purpose yet found. The length of wire required is from one inch to three and one-half inches in average cases. In its manipulation two pairs of pliers and a pair of clasp-benders are used (Figs. 3, 4, 5). The jaws of the largest

FIG. 3.

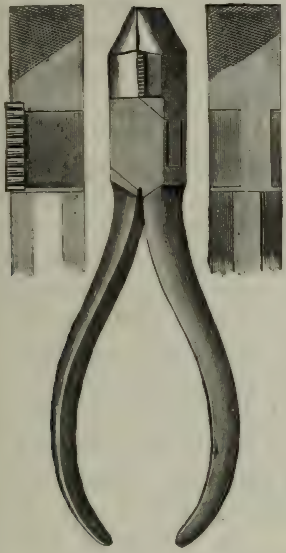


FIG. 4.

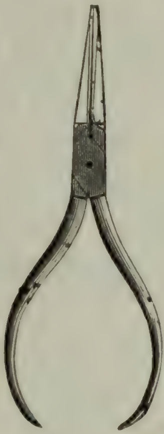
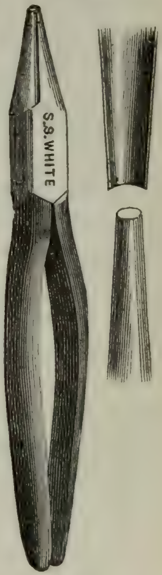
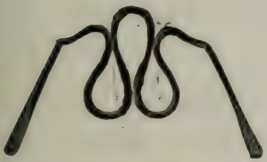


FIG. 5.



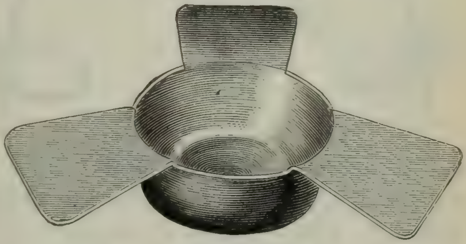
of the pliers (Fig. 3) are so made that they are useful to cut the wire into the proper lengths, and also to bend it to the required shape. After the wire is cut off with the large pliers, it is bent first in the center, then back on each side with the clasp-benders (Fig. 5),

FIG. 6.



Piano-wire ready for insertion in the vulcanite plate.

FIG. 7.



holding it with the pliers. Care must be taken to avoid getting any twists into the wire; the curves must be smooth and even. It is then put into shape to occupy its proper place when attached to the plate by manipulation with the fingers and the pliers, after which

the ends to be inserted in the rubber are bent at a sharp angle so as to raise the part which projects from the plate, and flattened with a hammer, no heat being used in any part of the work. The wire then presents the appearance shown in Fig. 6. For convenience in handling, pieces of binding-wire are attached to different points. The ends are then tinned, a small copper cup filled with molten tin (Fig. 7), which rests on a tripod, being used for the purpose. Some operators coat the whole surface of the wire with tin to prevent oxidation, but this is usually unnecessary, as it will be found that in most mouths the surface of the wire exposed to the action of the salivary fluids merely becomes discolored, but with a polished appearance. [The method of making the plate is described in the paper of Mr. Coffin at page 465.] After the plate is made it is inserted in the mouth for a short time, and then with a fine saw is cut in two, usually at the median line, care being taken not to cause any tension or twist of the wire. It is then replaced in the mouth and again worn a short time, after which it is taken out and, before being returned, the two halves are pulled apart slightly in the direction in which the force is to be applied. The amount of force and its direction are almost completely under the control of the operator.

The second method of correcting irregularities referred to by Dr. McKellops was that practiced by Dr. J. J. R. Patrick, of Belleville, Ill., and described by him in a paper read before the Illinois State Dental Society at its late meeting. The appliance is shown in Fig. 8. It consists of a half-round gold and platinum bar (A, A), curved to correspond with the shape of the arch, having upon it a number of sliding rings, by means of which anchorage is secured and attachment made to the teeth to be moved. The bar is bent with its flat surface inward, and is of sufficient length to allow its ends to rest gently on the external lateral surfaces of the first or second molars as desired. The slides are fitted accurately, so as to move steadily. Two of these, which are made longer for the purpose, are used to secure anchorage, by soldering to their inner surfaces thin gold bands (B,B), previously fitted to the teeth selected. The bar is held in position by set-screws (C, C), passing through them. Small buttons are soldered to their external surfaces, through which the

Fig. 8.

screws pass to give them greater purchase. To the smaller slides the different appliances for moving teeth are attached, as wedges, hooks, T-bars, loops, and bands (D, E, F, G, H, I), of various sizes and shapes, as required. The mode of operation is very simple. The apparatus acts as a lever, of which the power is the elasticity of the bow-spring, the fulcrums the points used for anchorage, and the resistance the tooth or teeth to be moved. If these are outside the arch, the bow-spring is adjusted so that its flat surface touches all of the projecting teeth, and is firmly set with the set-screws. The wedges are then forced together between the teeth to be moved and the bar; should the wedges cease to act before the teeth are properly placed, the set-screws are loosened, the wedges separated, and the bar taken up until its inner surface is again pressed against the projecting teeth, when it is again set firmly, and the wedges are again brought into play. To move teeth outward, the elasticity of the bow-spring is made to draw upon them by means of the proper appliance. Rubber bands or ligatures may be made useful auxiliaries. This appliance can be used on either jaw. Should the bar at any time exhibit a tendency to slip toward the gum, it can be held in its proper place by snapping one of the slides provided with a hook over the cutting-edge of a tooth.

Dr. W. C. Barrett. The wires commonly used for stringing pianos now-a-days are unfit for the purpose; the kind of wire required is that which is found in old pianos.

Dr. L. G. Noel, Nashville, had a difficult case of regulation a short time since, during the progress of which, when almost in despair of success, an idea had occurred to him which he had followed with happy results. The case was that of a girl nine or ten years old; the left central was out of position, and the left lateral had erupted just behind it, with its mesial surface forward. The bicuspids had just erupted, and the molars were too short to allow of their use in obtaining anchorage for a plate. Being thus unable to employ the usual appliance, he used small blocks of wood, forcing them between the misplaced lateral and central, gradually increasing the size of the wedges as the work proceeded. Before the tooth was forced outward to the proper position it became impossible to use the wedges further, because they could not be retained in place, owing to the enlargement of the space between the central and lateral and the dropping of the misplaced left central. In this dilemma he took a piece of stationer's rubber, and fastened it to the lingual surface of the left central with silk ligatures passed through the rubber with a needle. The elasticity of the rubber carried the lateral out in forty-eight hours. It remains yet to rotate the lateral, but this is comparatively an easy matter. His object in relating the case

was to call attention to the use of the rubber block, in the hope that the idea might profit others similarly placed. Splitting the needle-holes at the ends prevents the tucking-in of the rubber, and allows its free action upon the teeth.

Dr. L. D. Shepard, Boston, gave his indorsement to the Coffin method, with which he had been familiar for some years. Some ten years ago Dr. D. M. Clapp, who had been in the employ of Dr. Coffin, returned to Boston, bringing with him a knowledge of the method under discussion. Two years ago last May, at the meeting of the New York Odontological Society, the speaker had explained it, with models showing the manner of its application. He has used it more or less in his practice, but he never appreciated the variety of cases in which it could be applied, almost to the exclusion of all others, until he attended the dental section of the International Medical Congress. The method of J. D. White, shown in Kingsley's "Oral Deformities," is not to be mentioned in the same connection. The speaker has used three sizes of wire, and has been in the habit of dipping the whole spring in the tin to get rid of the oxidation. There are some mouths in which oxidation is very rapid; sometimes the wire becomes smoothly coated, not at all in the nature of the rough scales of rust on iron. In bending the wire, care should be taken that there shall be no sharp corners; every curve should be smooth and graceful. It requires so much care to produce a perfect result that the points can scarcely be learned without a demonstration, which he hoped Dr. McKellops would have an opportunity of making.

Dr. George L. Field, Detroit, was surprised that the Coffin plates had not been more extensively used. He has used them with great satisfaction, and he considered that, had he not derived any other benefit from his attendance on the dental section of the International Medical Congress, his trip across the ocean was well repaid by the knowledge gained of this one appliance. He hoped that the next time the dentists of Boston get hold of so good a thing for the profession at large they would not hide their light under a bushel. The speaker had been in Boston in attendance on association meetings, and on other occasions, and had never heard of the Coffin method until he went to Europe.

Dr. E. T. Darby, Philadelphia. There is one important point in connection with this matter which has not been broached by any of those who have spoken, and that is the necessity of having all the molars covered by the plate. If it only covers one, you will probably have a mal-occlusion when the plate is removed. A gentleman asks how to hold teeth which have been moved in their newly acquired position. The speaker's method is to construct a crib of rubber or celluloid, the bar of which just touches upon the teeth.

They should, of course, be held firmly, and the crib should be worn a sufficient time to insure that the teeth will not move. He indorsed most heartily all that had been said in favor of the Coffin method. He was present when Mr. Walter Coffin read his paper, when were shown a bushel of proofs of its efficacy in the shape of apparatus that had been used.

Dr. W. H. Eames, St. Louis, said that with the Patrick method there is no danger of displacing some of the molars, because there are no caps over any of them. It can be used with rubber tubing or with wire, if desired. He has been employing it for some time, and has never seen anything else to equal it. It is worn with the greatest comfort to the patient. The changes which it brings about in two or three weeks are surprising.

Dr. C. R. Butler, Cleveland, regretted that Dr. McKellops had not been able to make more extended practical tests of the Coffin method. The subject of regulation is so important that every aid ought to be gladly welcomed. The Farrar process is very nice on paper, but practically it is good for nothing, except in a very limited sense, because we cannot describe the many emergencies that may arise in treating a case of irregularity. Dr. Atkinson's method is good in many cases, but there is no cast-iron mold through which you can drive an imperfect set of teeth and have them come out perfect. The Coffin method covers more ground than any other with which the speaker is acquainted. It is the least expensive of any, but no bungler can make it work successfully,—nor any other method, so far as that is concerned, no matter what it is. It requires an artist to get the best results. Another important item is that the apparatus can be removed by the patient for cleansing. In regulating, we must have points of leverage, and thus must apply force to teeth that we do not want to move. By this process we can move those we want to move and leave the others where they belong. It is not so difficult to move teeth as it is to hold them in their places. He had found more difficulty in this particular than in changing their places; putting on a splint, as described by Dr. Darby, or some other equally effective procedure, was quite essential in the majority of cases.

Dr. Eames thought that of the two methods prominently discussed that of Dr. Patrick was the simpler, because you have only the band which passes around the arch, with the simple devices for attachment to the teeth which have been mentioned. For a simple case, the apparatus can be constructed and applied in an hour's time.

Dr. W. H. Dorrance, Ann Arbor, Mich., cautioned those who attempted to use the Coffin split plate that the wire must not be too large. A small wire has sufficient elasticity to do the work. If too large a wire is used the result is accomplished so quickly as to be

liable to cause injury to the parts. Any tooth can be moved by this method in or out, or rotated, with a little skill and ingenuity in constructing the appliance, and with a little care in the application of silk ligatures.

Dr. G. W. Keely, Oxford, Ohio, has done a little at regulating for a quarter of a century, and had made a good many appliances of different forms, but he had never yet reached the conclusion that he had the only one that would do the work. Twenty years ago a little miss came to him with the central incisors erupted and locked inside the lower teeth. He made a rubber plate with bands outside the teeth having two little buttons, with rubber ligatures to draw the teeth into place, which was done in forty-eight hours. He then reinserted the plate, tying the teeth to it with No. 40 cotton thread; in two weeks time the teeth were firm, and the plate was removed. To-day, were he called upon to treat a similar case, he would make a plate covering the teeth, thick on the palatal surface, cut a slot in that thick part, and insert in that a sea-tangle tent. With one piece in simple cases twelve hours would be sufficient, and he would then hold them in position for a week, with No. 40 thread, waxed, passed over the cuspids and around the teeth that had been moved. Dr. Keeley described several cases in which the sea-tangle tent was used with success. Dr. Morrison condemns the extraction of the first molars for purposes of regulation. So does the speaker, if they are sound; but it is a very common thing to find those teeth, in children eight or ten years of age, badly demoralized. If they are extracted, in such cases, just before the second molars erupt, these latter will take their places without tipping.

Dr. Peirce said there were many cases of irregularity which could be cured without taking an impression or making any special apparatus. In a case of this class, where all four of the superior incisors struck inside of the lower teeth, he simply drilled a small hole in the laterals near the cutting-edge, and another in the sixth-year molars near the gum, and inserted a small piece of platinized gold plate—say, one-sixteenth of an inch wide, or wider—on each side. These plates or wires are out of the way of the tongue and of the teeth, and in any patient between sixteen and twenty-five years of age will press the teeth forward in a very few days. The centrals were then acted on in the same manner. The small openings made are readily filled, and they are not in positions where they are likely to cause decay. He ties the band by a thread to some of the teeth, so that if it gets thrown out of its position by any accident it cannot get down the throat. The elasticity of the plate is sufficient to get all the force required. When the first two teeth are in their proper positions, he makes a very thin rubber plate to hold them

while the others are being brought out. Sometimes there is danger of splitting the maxilla at the symphysis. In such cases he ties a ligature around the two centrals, which averts any possibility of that kind.

Dr. Keely said the extraction of the first molar, when indicated, gives plenty of room for the third, and when this is done you will find it just as good a tooth as the second, in nineteen cases out of twenty.

Dr. J. N. Crouse, Chicago, described an extreme case he had had. A young man, twenty-one years of age, with very narrow jaws; the lower narrowing so much in front that it was impossible for the patient to get his tongue into it, and it would fill up with tartar in a very short time. The speaker had first to move the upper teeth; some of them one and one-half inches. The work was done entirely with rubber plates and jack-screws, using two jack-screws, as it was a very heavy alveolus. An appliance was made to hold the ground gained, and the lower jaw was then expanded in a similar manner, using two jack-screws on it also. The movement was not so great in this case, being about one and a quarter inches. The whole operation required about a year.

Dr. B. G. Marcklein, Milwaukee, said it seemed evident that the Coffin appliance is sufficient for expansion of the arch, but is it just as applicable where you wish to draw teeth in? This is more difficult of accomplishment, in his experience. He has now under his care a young lady, sixteen years of age, whose first molars are gone, and the ten anterior teeth must be drawn backward.

Dr. McKellops. It is done by the Coffin method by arranging springs of piano-wire to act upon the teeth required to be moved.

Dr. Marcklein. This is an extreme case. In the efforts that I have made to correct it, I find that the second molars, which I have endeavored to use as anchorages, move before the ten other teeth.

Dr. Darby would force the refractory teeth back one at a time with wedges, and hold them with a crib plate.

Dr. Morrison. Dr. McKellops brought the original Coffin plates from Europe in 1865; the speaker has since made many of these, and they are very effective where you can get good anchorage. He does not believe in the extraction of the sixth-year molars for regulating. If you will delay a little while you will see the necessity for it gone. You know that the twelfth-year molars are advancing, and if you extract the sixth-year you will injure the growth of the others. If they are let alone, you will have a normal occlusion all the time. He would advise Dr. Marcklein, in the case he stated, to enlarge the lower jaw, and not devote all his attention to the upper. By so doing he can make the deformity less apparent. If this were not practical, he would adjust ligatures and use a skull-cap.

Dr. Keely showed models of the mouth of a boy of fifteen, whose first molars were filled, and were also decayed at other points; the teeth also required regulation. Would not Dr. Morrison in this case extract?

Dr. Morrison. It would be robbery to extract a tooth. He would use the Coffin plate or jack-screws.

Adjourned to two o'clock, P.M.

The election of officers was held Thursday afternoon, with the following result: W. H. Goddard, Louisville, president; Geo. J. Friedrichs, New Orleans, first vice-president; E. T. Darby, Philadelphia, second vice-president; A. W. Harlan, Chicago, corresponding secretary; Geo. H. Cushing, Chicago, recording secretary; Geo. W. Keely, Oxford, Ohio., treasurer; J. N. Crouse, Albion M. Dudley, Geo. L. Field, executive committee.

Drs. W. C. Barrett, Chas. R. Butler, and Geo. L. Field, were appointed the committee of arrangements.

Drs. E. T. Darby and A. W. Harlan were appointed members of the publication committee, of which the recording secretary is *ex-officio* chairman.

Niagara Falls was selected as the place for the next meeting.

NATIONAL DENTAL ASSOCIATION OF THE UNITED STATES OF AMERICA.

The third annual meeting of the National Dental Association of the United States of America was held at Washington, D. C., beginning Thursday, August 3, 1882.

An amendment to the constitution was adopted, providing for biennial sessions of the association, to be held at Washington, instead of the plan previously pursued.

The following officers were elected:

Dr. R. B. Winder, Baltimore, Md., president; Dr. J. B. Rich, New York, N. Y., first vice-president; Dr. V. E. Turner, Raleigh, N. C., second vice-president; Dr. W. W. Ford, Macon, Ga., third vice-president; Dr. J. R. Walker, New Orleans, La., fourth vice-president; Dr. W. W. Evans, Washington, D. C., fifth vice-president; Dr. R. Finley Hunt, Washington, D. C., secretary; Dr. E. S. Chisholm, Tuscaloosa, Ala., assistant secretary; Dr. H. B. Noble, Washington, D. C., treasurer; Dr. J. P. Holmes, Macon, Ga., assistant treasurer. Dr. J. B. Rich, New York, N. Y.; Dr. W. H. Dwinelle, New York, N. Y.; Dr. John Allen, New York, N. Y.; Dr. V. E. Turner, Raleigh, N. C.; Dr. A. Curtiss Smithe, Washington, D. C., committee on correspondence with United States Government. Dr. J. B. Hodgkin,

Washington, D. C.; Dr. G. W. Rembert, Natchez, Miss.; Dr. T. M. Allen, Eufaula, Ala., executive committee.

The next meeting of the association will be held at Washington, commencing on the fourth Tuesday in July, 1884.

R. Finley Hunt, *Secretary.*

SOUTHERN DENTAL ASSOCIATION.

The fourteenth annual meeting of the Southern Dental Association was held in the lecture-room of the Baltimore College of Dental Surgery, commencing Tuesday, August 8, 1882, President E. S. Chisholm in the chair.

The sessions were largely attended. Several amendments to the constitution were adopted, the most important of which were those dividing the territory to which the association mainly restricts its labors into four districts, as follows: I., Maryland, Delaware, District of Columbia, Virginia, West Virginia, North Carolina; II., South Carolina, Georgia, Alabama, Mississippi, Florida; III., Louisiana, Texas, Arkansas, New Mexico, Arizona, Indian Territory; IV., Kentucky, Tennessee, Missouri; and providing for meetings in the various districts in rotation. A detailed report of the papers and discussions will appear in the next issue of the Dental Cosmos.

The following officers were elected: L. D. Carpenter, Atlanta, president; J. M. Riggs, Hartford, Conn., first vice-president; R. A. Holliday, Atlanta, second vice-president; J. R. Walker, New Orleans, third vice-president; H. J. McKellops, St. Louis, fourth vice-president; J. F. Thompson, Fredericksburg, Va., fifth vice-president; J. P. Holmes, corresponding secretary; W. H. Hoffman, Charlotte, N. C., recording secretary; H. A. Lowrance, Athens, Ga., treasurer; R. A. Holliday, J. H. Coyle, A. G. Bouton, T. M. Allen, C. C. Patrick, executive committee.

Adjourned to meet in Atlanta, Ga., the second Tuesday in August, 1883.

AMERICAN MEDICAL ASSOCIATION—SECTION ON DENTISTRY.

The American Medical Association convened in the city of St. Paul, Minn., on Tuesday, the 6th day of June, 1882, about one thousand delegates in attendance.

The association met in body at the Opera House in the morning, discussing such matters, presenting such motions and resolutions as especially interested the profession at large.

At 3 o'clock p.m. each day the seven departments of practice, or "sections," met in the respective halls in the city provided for their

use, and discussed professional matters pertaining to their specific fields of practice.

Section VII., on Dental Surgery, assembled at 3 P.M., Tuesday, June 6, at the City Council Chamber, Dr. D. H. Goodwillie in the chair, and Dr. T. W. Brophy as secretary.

The chairman called the meeting to order, giving a brief synopsis of the objects of the Dental Section of the American Medical Association.

Dr. W. W. Allport moved that a committee of three be appointed by the chair to supervise the papers before publication, and Drs. Allport, Brophy, and Williams were designated as such committee.

A paper on "Oral Hygiene" was read by Dr. W. D. Kempton, in which attention was directed to the complex structure and diversified functions of the mouth; the chemical effects of decomposing food upon the dental organs; the consequent vitiation of the salivary fluids and of the air supplied to the lungs; the devitalization of the pulp, with resulting periostitis and abscess; the interference with mastication by the sensitiveness resulting from decay or from the loss of the teeth; the dyspepsia and general ill-health in consequence, and the eye, ear, and head troubles frequently associated. The province of the dentist was considered with reference not merely to the repair of the teeth, but to an improvement of their structure. The various causes of defective structure were discussed, including heredity, the undue stimulation of the nervous system by the "cramming" process in education, and the modern styles of cooking, which present food requiring but little if any mastication. The removal of the exciting causes of decay was regarded as of the greatest importance. The patient should be instructed with reference to proper brushes and dentifrices and the best times and methods of using them.

The subject was discussed by Drs. J. L. Williams, E. S. Talbot, W. W. Allport, J. B. Lawrence, and J. S. Marshall.

At the meeting on Wednesday the secretary read a paper by Dr. W. C. Barrett, detailing a case of remarkable wearing or wasting away of all the teeth of both jaws, illustrated by models.

Cases in practice were reported by Drs. Allport and Lawrence.

A lengthy paper was read by Dr. Marshall, on "The Necessity for the Appointment of Dental Surgeons in the Army and Navy of the United States." The subject was very fully discussed by the members, and a resolution adopted as follows:

Resolved, That a committee of three be appointed by the Chair for the purpose of considering the subject of the appointment of medically-educated dental surgeons in the army and navy; that Dr. E. Maynard, of Washington, and the Surgeons-General of the army and navy, be requested to co-operate with the com-

mittee, and that the committee furnish them with statistical reports illustrative of the needs of the soldiers and sailors in this direction.

The chair appointed Drs. Allport, Marshall, and Williams as the committee.

Dr. Lawrence offered the following resolution, which was adopted:

Resolved, That the chairman of Section VII. of the American Medical Association appoint a committee to investigate the subject of "Food," including as far as possible the process of mastication, insalivation, digestion, and assimilation, with special reference to its appropriation to tooth-structure; results to be reported at the next annual meeting.

At the general convention of the American Medical Association on the morning of Thursday, June 8, it was resolved to change the name of the Seventh Section from that of "Dentistry" to "Dental and Oral Surgery."

At the meeting of Section VII., on Thursday, Dr. Talbot read a paper on "The Injurious Effects of Mercury in Dental Operations." The paper was devoted to a discussion of the vaporization of mercury from amalgam fillings, and its injurious constitutional effects.

Dr. Allport read a paper on "How Dentists Should be Educated," claiming that all dental surgeons should receive a medical education and become legitimate specialists in practice, and that all medical graduates should be as fully educated in relation to dental and oral diseases as they are in any other department of medical science; that dental and medical students should pursue the same studies, and that the same knowledge should be exacted of each; that to this end chairs on dental diseases should be established in all medical colleges, and filled by medically-educated and practicing dental surgeons.

Dr. Lawrence followed with a paper on the same subject.

Dr. Goodwillie recited a number of cases in practice, illustrated by wax models, and explained the character of the operations performed.

The association adjourned to meet next year at Cleveland, Ohio.

NEW YORK ODONTOLOGICAL SOCIETY.

Regular meeting, April, 1882, at the house of Dr. Hoag. President S. G. Perry in the chair.

Dr. Bödecker. I was requested to prepare an enlarged diagram of a tooth for the use of the society, illustrating the minute anatomy of the dental tissues. Through the favor of Dr. Heitzmann I have here such a drawing, enlarged and colored, as you see, which I shall make use of in the paper I am now about to read.

[Dr. Bödecker then read the second part of his paper on "The

Minute Anatomy, Physiology, Pathology, and Therapeutics of the Dental Pulp," published in the August number of the DENTAL COSMOS.]

Dr. Jarvie. I would like to find out how Dr. Bödecker determined the extent to which he was going to devitalize the pulp,—where he was going to stop in the devitalization?

Dr. Bödecker. I have stated that in the paper.

Dr. Jarvie. How do you devitalize the portion nearest the crown?

Dr. Bödecker. Put the arsenious acid in the coronal portion of the pulp, previously making an application of a solution of carbolic acid and tannin, the formula of which I have given; this prevents too great action of the arsenious acid. After twelve to twenty-four hours, remove that and dress the pulp; the lower portion of it will be perfectly natural.

Dr. Jarvie. There will be a line of demarkation between the living and dead pulp?

Dr. Bödecker. You must go below the demarkation. Witzel describes that very nicely. If I had a little more time I could describe it in a more intelligible manner. Witzel amputates that part of the crown of the pulp, but leaves the other portion alive. I have found that to work very well in some cases where there is not a total inflammation; if there is a total inflammation it is of no avail.

Dr. Jarvie. In those cases you do not attempt to save any portion of it?

Dr. Bödecker. No.

Dr. Hill. In that amputation you must go below the line, if possible?

Dr. Bödecker. You must always go a great deal below the line of demarkation.

Dr. Hill. Then the application of arsenic does not affect the whole pulp within twenty-four hours?

Dr. Bödecker. No, sir.

Dr. Littig. Would it not be better to cut it out?

Dr. Bödecker. It would; but it is sometimes, as Witzel says, "an uncomfortable sensation for the patient." As one of our great men in Europe has said, "When you wish to find out whether you have to do with an exposed pulp, take a sharp-pointed instrument and stick it in the cavity of decay; if now the patient jumps and blood flows freely from the cavity, that nerve is exposed!" [Laughter.]

Dr. Littig. Have you ever had occasion to open such a tooth a year or two afterward to see if the pulp was still living?

Dr. Bödecker. I have on two occasions opened the pulps—not opened them, but extracted them. In one instance, I remember,—a child about ten years old, having the sixth-year molar pretty badly broken down—I saw it was a fair chance for experimenting, because the child was very brave, and I made an application of arsenious acid and amputated the pulp. I have now in my collection the stump of this pulp, which is perfectly normal.

Dr. Wm. H. Allen. This is not an uncommon thing; I have seen it many times. In molars with three roots I have seen the pulp destroyed in one and alive in the other two, destroyed in two and alive in the other.

Dr. Hill. Is it not uncommon to apply the arsenic and have it kill one portion of the pulp and not another, affecting so far and no farther? Can you tell just how far it has affected?

Dr. Jarvie. I presume I was not listening at the proper time, or I overlooked one thing. Dr. Bödecker was giving a transcript from the writings of the various histologists as to what part the odontoblasts took in the formation of dentine. Some maintain that the odontoblasts are directly transferred into dentine. I do not catch what is Dr. Bödecker's own idea.

Dr. Bödecker. The drawing shows it beautifully. I will give the description. The odontoblasts are nothing but protoplasmic bodies, just as you find them in the middle of the pulp, only in this vicinity there is very little basis-substance between them; but there is some, and between these odontoblasts the dentinal fibers lie.

Dr. Jarvie. Is that not as Tomes describes it?

Dr. Bödecker. No; he says the dentine sheath and the matrix are formed of odontoblasts, but that is not so. Even Franz Boll failed to see one particular thing, and that is the one thing he left for me to see. He saw the nerve-fibers becoming axis-cylinders between the odontoblasts, and in some instances he has followed them in the dentinal canaliculi, but he believes there are two sets of dentinal canaliculi, one of which receives the nerve-fibers, and another set which receives the processes of the odontoblasts. Now, I have looked over a great many specimens, but have not seen in one instance a process directly on the point of the odontoblast.

Dr. Jarvie. I should like to hear from Dr. Atkinson, because the theories advanced are, I think, diametrically opposed to what he believes are the facts, and that we may hear from both sides.

Dr. Atkinson. If I had anything to say it would occupy more time than I can command now to make myself comprehended; but I want to say this, that many times when we are viewing a subject from one single position we make statements that will not always be borne out after we have surveyed the course of observation

further around. Probably in my observation I have been as earnest as any man could be, and have arrived at as good conclusions—when I have really come to a conclusion—as men in general. I am one of those who believe in speaking as I think, whether I am speaking of my own observations or of those of others, but so repeatedly have I had to modify my conclusions that I rather wish to investigate further where I find a difference among observers whom I respect. I have never seen such honest differences elsewhere among men as among histologists; there is opportunity for improvising and presenting immature conclusions upon statements of supposed facts in this direction that transcends all others in such ratio that I have no means of measuring it. I have never yet seen an honest drawing of tissues. What do I mean? They actually give you precisely that which was overlooked in the specimen before us, but in all diagrammatic work I have never seen a finer thing than this now presented to us.

There are a great many questions which arise that only those who are earnest can comprehend. When the question was asked, whether it is important to understand the minute structure of the organ in order to competently treat it, you see how the idea came out in asking how far the arsenious acid had penetrated the pulp, and you observe the only reply to that was that it was supposed that the preliminary preparation so acted upon the pulp as to stop off the penetrating power of the arsenic, and just prevent its destroying the entire pulp. There is a great deal said that is merely jumped at —conclusions without making observations as close as it would be desirable to make them, if we expect to get the last word of truth. Dr. Allen said he had seen teeth where a portion of the pulp remained alive after a long time, and others thought they had done so. I have known more than twenty applications of arsenic made to the pulp and still it was not destroyed, and there is so much ambiguity about the method of proceeding that Dr. Hill's questions cannot be answered categorically.

You see what a field is before us, and if there were time enough I would not object to being asked any question, and I would answer it if I knew how, but if I did not I would say that I did not know, and so set up a finger-board and say, "Truth is in such and such a direction."

Dr. Howe. I cannot allow the occasion to pass without expressing my extreme admiration for the perseverance and indefatigable industry that Dr. Bödecker has displayed in the presentation of the papers he has favored us with. I wish to thank him personally for the information that he has given to us all. I can have little but commendation for everything he has said. There are one or two points,

however, that I think specially worthy of mention in connection with his therapeutics. I was surprised, in his very discriminating directions, or, I should say, clinical points, given in the diagnosis of pulp-condition and treatment, that he had nothing to say in relation to the condition of the *patients*, as well as the condition of the pulp. He gave us points for treatment of the pulp, according to his conclusions,—his diagnostic conclusions,—but he laid them down without reference to the condition of the patients. I only speak of that, because it seems to me an important point, and I suppose he did not refer to it because it is a matter of such breadth as to be almost impossible to be included in his paper. I am very glad to realize that the use of arsenic for the treatment of pulps is by him placed upon a scientific basis; that in conditions where the pulp-tissue has commenced a retrograde metamorphosis through this pathological condition, the best way for the patient, as for the tooth, is to devitalize and remove it. I am glad, I say, that he has come to this conclusion. He stated in the first portion of his paper that he did not consider the loss of the pulp of a fully-formed tooth as of very much importance. I was therefore surprised that he was willing to resort to so much trouble and put the patient to so much trouble and pain in the endeavor to save small stumps of pulps in teeth which he has not described as specially needing those little fragments. I must say that I think some of the points he touched upon there seemed somewhat empirical rather than scientific.

Dr. Bödecker. In the first place, of course, in the paper there are a good many things which originally I wanted to bring out a great deal more and a great deal further, but as our president thought it not advisable to make three meetings out of this one subject, I concluded to shorten the paper and bring as much as I possibly could in this last portion; therefore, a good many things have been left out. So much for that.

As to the advisability of retaining alive even a portion of the pulp, I think it is of great importance, especially in the molar teeth. Every one knows how difficult it is to remove the whole of the pulp from some roots—from the buccal roots of the upper molars, for instance. If you can conveniently preserve these stumps alive and in good condition, I think those roots are far better than when the pulp is destroyed and imperfectly removed, as it is likely to be under these circumstances.

Dr. Howe. I think the answer is sufficient to justify the recommendation that he has made. I do not feel competent to express any opinion as to the probable ultimate result of such experiments in that direction, but the reason given for the procedure is sufficient.

Dr. Abbott. In regard to the application of arsenic and its effect

stopping at a definite point, and our ability to take off a certain amount of the pulp of the tooth, and all that, I am a little bit in the dark. I should not like to express an opinion based on my own experience as to the advisability of that practice, because it has not been sufficient. I have no doubt that a tooth is better with the pulp left living in the roots and the diseased coronal portion removed. There are several advantages in having it in this way. For instance, the putrefaction of the organic material does not take place; discoloration is also prevented, and, as a general rule, there is less likelihood of having abscess occur in a tooth treated in this way.

Looking the ground carefully over, I think it is a duty to save all that can live, even such as may have given pain or discomfort to the patient.

Dr. Bödecker. I have in my hands the work of Witzel, who writes very fully of this practice. At first, I was inclined to discredit his statements, but after careful consideration of the work I am satisfied that he is an honest man. He says that up to the time of writing his book he had performed six hundred amputations of the pulp, of which he had not seen a single failure.

Adjourned.

ODONTOLOGICAL SOCIETY OF PENNSYLVANIA.

The regular meeting of the Odontological Society of Pennsylvania was held Saturday evening, March 4, 1882, at the office of Dr. Daniel Neall, President Dixon in the chair.

Dr. E. R. Pettit exhibited models of a case of irregularity both before and after correction. The irregularity consisted principally in a very great (inherited) prominence of the upper front teeth. After correcting this and retaining the teeth in position for some months they had returned to their former position soon after the apparatus was removed. He inquired as to the probability of ever retaining them in proper position without the constant wearing of a retaining apparatus, as the tendency to return seems greater in cases of this character than in any other.

Dr. Darby. I should make a rubber plate to fit the roof of the mouth, capping also the molars, and let a band of rubber pass around the labial surfaces of the front teeth, thus holding them firmly in position. This I would have the patient wear at least a year, or until I was satisfied that new bone had been formed.

Dr. Jas. Truman's paper, entitled "Assimilation of Organic Particles—Topical Action of Mineral Waters,"* read at the last meeting, was then discussed.

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* This paper was published in our April number.—Ed. Dental Cosmos.

Dr. Buckingham. This paper requires, for proper discussion, a great deal of consideration and preparation. There is one thing I cannot clearly understand, and that is, what causes the acid reaction of the neutral solution and the changes of mineral or inorganic matter into organic. We have the Tyndall and Pasteur theories on the cause of life, besides the materialists' views. Inorganic substances taken into the system must be in solution that nutrition may be obtained from them.

Dr. Neall. Civilization, with its inevitable concomitants of luxury, etc., has led to inherited weakness of tooth-structure. It has also taught us the use of agencies to resist such encroachments. Among these primarily is every-day systematic cleanliness, the removal by the simple means at every one's hands of these accretions which assist most assuredly and powerfully by chemical change in the decay of tooth-substance.

Dr. Truman. I do not regard the administration of combinations of inorganic materials to be of any value in the nutrition of tooth-tissue. To make them of value they must first be presented in the form given us by lower organisms, and from these natural selections will follow suitable to each organ. Observations in lime-water districts lead positively to the conclusion that the water thus impregnated is utterly valueless, if, indeed, it does not have a decidedly injurious influence. In answer to Dr. Buckingham, I hold that the greatest change in the oral secretions from a neutral to an acid condition is at night or during periods of rest.

Dr. Darby. I have been greatly interested in Dr. Truman's paper, and can confirm what he has said with reference to the character of the teeth of those who inhabit lime-stone regions and where the water is largely impregnated with lime. It is undoubtedly good practice to rinse the mouth with lime-water, and the use of prepared chalk is also good as a precautionary measure, neutralizing, as it must, the acidity of the mouth, but whatever of the lime-salts enter into the teeth must be introduced through the system in the form of food. I am heartily in sympathy with the effort which is being put forth by parents and others to feed children largely upon those articles of food which contain the phosphates in greatest abundance. I am not prepared to say that the effect of such food would be apparent in a single generation, but it is my firm conviction that the effect would tell beneficially in a few generations, and certainly those articles which contain the phosphates in large quantities are nutritious and pleasing to the taste.

Dr. Truman presented for inspection two condensing burnishers to be used with the hand-mallet in the distal surfaces of posterior teeth. They were sent to him by Dr. Jenkins, of Dresden, Germany,

who had devised them for this purpose and used them with great satisfaction. They are most conveniently used when an assistant is employed to do the malleting.

The regular meeting of the Odontological Society of Pennsylvania was held Saturday evening, April 1, 1882, at the residence of Dr. E. H. Neall, Dr. Truman in the chair.

Incidents of Practice.

Dr. Register. I brought out a lateral incisor nearly half an inch in just one week for a miss thirteen years old. I saw her but once; she turned the jack-screw herself, and no pain nor inflammation followed. I think it a mistake, however, to push teeth too rapidly, if the tissues are at all hard. To avoid cutting a cavity in the palatal portion of a tooth, at the suggestion of Dr. Kirk I placed a very thin band of platinum around the tooth, and filled against it and the palatal wall with amalgam; I made a depression in this and adjusted the point of the jack-screw.

Dr. Guilford. In regulating teeth, that is, in bringing them from an abnormal into a normal position in the arch, several things have to be taken into consideration. First, we must devise an appliance that will be effective; second, it must be constructed as simply as possible; third, it must do its work as quickly as possible, consistent with the existing circumstances; fourth, it should give as little pain as possible; and, lastly, it must be fixed in its position, and not liable to slip and cause injury and possibly defeat its object. Some of these considerations are too frequently overlooked by many who undertake this difficult class of work. There have been many systems, so-called, for the correction of irregularities, but no one of them contains all that is good or all that we need. The successful practitioner in this line is he who takes from each "system" that which will best serve his purpose, and then uses this with discretion. We sometimes see appliances for regulating illustrated and recommended in our journals that would require a master mechanic to construct and a skilled engineer to run. The idea also of moving teeth only on exact mathematical distance in each twenty-four hours is a fallacy. What we want is to use appliances not too powerful, and then push our work along as rapidly as possible, having regard, of course, to the age and health of patient and the surrounding conditions. Much harm has been done in years past by the slipping of appliances and the consequent wounding or injury of the soft tissues. The pain that is usually attributed to the moving of the teeth too rapidly I have satisfied myself is due to the rubber band, or ligature, or plate,

or appliance impinging upon the gum. To avoid this, I have for the past ten years adopted a plan of keeping all my fixtures from touching the soft parts. I simply make bands or rings of platinum plate, and slip one over the tooth to be moved and the other over the one that I want to use as my fixed point of resistance. To these have been previously soldered either pins, hooks, or bars, as the case may be. The bands are lined with phosphate of zinc and slipped over their respective teeth to a point about midway between the cutting-edge and neck. Being kept dry for five minutes to harden, they will afterward resist all the force we may apply to them without becoming loosened. Out of scores that I have applied in this way, none that were properly placed have ever become loosened, though force has been applied to them for months continuously. If we wish to use a jack-screw as our power, instead of a rubber band or bar, we need only solder stays or abutments to these bands at proper places and countersink them to receive the ends of the jack-screw. By their use we will have no slipping of fixtures, no impinging upon gum, and hence the very least amount of pain. In a couple of cases recently treated in this way, in each of which a central incisor was moved the width of its crown, and moved, too, as rapidly as double rubber rings would move it, occupying about a month's time in each instance, both patients have declared to me time and again that they suffered absolutely no pain.

Dr. Register. The only advantage in using the oxychloride instead of amalgam is that it sets quicker. I should prefer the oxyphosphate to it, however, as it is harder. In regard to teeth not hurting when bands and ligatures are kept free from the gums, I think Dr. Guilford is mistaken; irritation of the peridental membrane will result in any case if tissue and movement are not made to harmonize.

Dr. E. H. Neall. Two years ago I gave the society my method of making hard-rubber and corundum disks and points, and stated that I had used them with a great deal of satisfaction. Since that time I have had them in daily use, and these that I show you this evening have done considerable work, and yet show little signs of wear. While these disks do not cut tooth-bone as rapidly as corundum disks, yet they do cut and leave a polished surface; they are invaluable as trimmers and polishers of gold fillings. Another advantage is that they can be made very thin and will bear quite rough handling without chipping or breaking. So far as I know, these disks are not to be had at any of the depots, although I understand that The S. S. White Dental Manufacturing Company are experimenting in that direction, and expect to have them in the market at an early date.

Dr. Register. I take black or red rubber and heat over a sand-bath made in a small glue-pot; great care must be exercised not to cook the rubber. The same result can be obtained by boiling in oil and rubbing into the rubber as much corundum or emery as possible.

Dr. Bonwill. As to the originality of mixing corundum and rubber by heat for making files, wheels, etc., I did it as far back as 1861 and 1862 for cutting down gold fillings and smoothing enamel. I would not speak of this, but it is well to keep history correct, even if it has to be repeated. To incorporate the material thoroughly and in proper quantity very heavy machinery must be used and the heat kept very uniform. Small quantities can be mixed by hand, but it hardly pays. For my own use since 1872 I have had it made in quantity by machinery.

PENNSYLVANIA STATE DENTAL SOCIETY.

The fourteenth annual meeting of the Pennsylvania State Dental Society was held at Williamsport, commencing Tuesday, July 25, 1882. The meeting was one of the largest in the history of the society.

The following officers were elected for the ensuing year: Jesse C. Green, West Chester, president; S. H. Guilford, Philadelphia, first vice-president; Charles J. Essig, Philadelphia, second vice-president; E. P. Kremer, Lebanon, recording secretary; W. B. Miller, Altoona, assistant recording secretary; W. H. Fundenberg, Pittsburgh, corresponding secretary; G. W. Klump, Williamsport, treasurer; W. E. Magill, James Truman, G. L. Robb, C. S. Beck, G. Elliott, board of censors.

The next meeting will be held at Cresson Springs, commencing the last Tuesday in July, 1883.

Edw. P. Kremer, *Recording Secretary*, Lebanon.

GEORGIA STATE DENTAL SOCIETY.

The annual meeting of the Georgia State Dental Society was held at Macon, commencing Tuesday, May 9, 1882.

It was largely attended, and a generally prosperous condition of the profession in the State was indicated. The following officers were elected: D. Hopps, president, Atlanta; J. P. Holmes, first vice-president, Macon; J. M. Mason, second vice-president, Columbus; G. W. H. Whitaker, recording secretary, Sandersville; L. D. Carpenter, corresponding secretary, Atlanta; H. A. Lowrance, treasurer, Athens; J. A. Coyle, L. D. Carpenter, G. W. McElhaney, A. G. Bouton, S. B. Barfield, executive committee and examining board.

The next meeting will be held at Atlanta, on the second Tuesday in May, 1883.

L. D. Carpenter, *Corresponding Secretary*, Atlanta, Ga.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA.

The regular annual meeting of the Odontological Society of Western Pennsylvania was held at Washington, Pa., June 13, 1882.

The following list constitutes the officers elected to serve for the ensuing year: J. P. Thompson, president; W. E. Van Orsdel, vice-president; H. Depuy, secretary; L. Depuy, treasurer; H. W. Arthur, J. G. Templeton, Gale French, board of censors; Geo. G. Crowe, D. P. Stewart, M. B. Lowry, Gale French, J. E. Libby, delegates to State Dental Society; Courtlen King, Gale French, H. W. Arthur, delegates to American Dental Association.

Adjourned to meet at Johnstown, Pa., September 12, 1882.

H. Depuy, *Secretary*, Pittsburgh.

MAINE DENTAL SOCIETY.

The Maine Dental Society held its seventeenth annual session at Dexter, Me., July 18 and 19, 1882.

The officers elected for the ensuing year are as follows: M. B. Preble, president; E. C. Bryant, vice-president; D. W. Fellows, secretary; E. J. Roberts, treasurer; T. Fillebrown, librarian; G. M. Twitchell, chairman of executive committee.

The next annual session will be held in Portland, commencing on the third Tuesday in July, 1883.

D. W. Fellows, M.D., *Secretary*, Portland.

EASTERN ONTARIO DENTAL ASSOCIATION.

The third annual meeting of the Eastern Ontario Dental Association was held in Toronto, Canada, July 18, 1882.

The following were elected officers for the ensuing year: C. A. Martin, L.D.S., president; J. H. Clark, M.D., D.D.S., L.D.S., vice-president; George H. Weagant, L.D.S., secretary-treasurer.

Geo. H. Weagant, *Secretary*, Cornwall.

SOUTHWESTERN DENTAL SOCIETY.

The third annual meeting of the Southwestern Dental Society will be held at Springfield, Mo., on the 13th, 14th, and 15th days of September, 1882.

By order of the Executive Committee.

E. Hovey, Springfield, Mo.

EDITORIAL.

DENTAL INSTRUCTION IN MEDICAL SCHOOLS.

The statement in the last issue of the Dental Cosmos that Rush Medical College proposes "to furnish students an opportunity to prepare themselves for the practice of dentistry in connection with their medical studies, and to grant certificates of qualification at the conclusion of the medical course," was an error due to a misapprehension of the facts. We are informed that the arrangement in Rush Medical College is the same as that adopted by five of the six medical schools in Chicago, which have instituted professorships in dental surgery, for the purpose of imparting instruction in dental matters to their medical students.

BIBLIOGRAPHICAL.

Primary Phonography. An Introduction to Isaac Pitman's System of Phonetic Shorthand. By Ida C. Craddock, Teacher of Phonography at Girard College. Philadelphia: 1882. Price, $1.50.

More than five hundred thousand persons have begun the study of shorthand in this country alone; of these, about ten thousand may be said to have some knowledge of the art, while only three hundred are expert practitioners. Much of this falling by the wayside is due to the fact that students have attempted the use of the more advanced technicalities before they were well grounded in the underlying primary principles; for which, indeed, the faulty construction of the text-books is largely to blame, in that they do not hold the student long enough to the study of the elements. Miss Craddock's little book is intended to remedy this defect. Its whole scope is the careful, methodical unfolding of the principles upon which shorthand writing is founded; no subject being passed until it has been thoroughly explained, and sufficient drill imposed upon the pupil to make it his permanent possession. The book should be in the hands of every beginner.

OBITUARY.

DR. GEORGE E. HAYES.

Died at Buffalo, N. Y., April 27, 1882, Dr. George E. Hayes, aged seventy-eight years.

The death of Dr. Hayes removes a prominent man from the ranks of dentistry. He was one of the early practitioners of western

New York. He was of the same stock as the late President of the United States; was born at Granby, Conn., from which place his father removed with his family to Prattsburgh, N. Y., in 1806, and subsequently to Canandaigua, where Dr. Hayes studied medicine under a relative, and incidentally read some works on dentistry. In 1829 he went to Buffalo and opened a pharmacy. At that time Buffalo was a mere village, containing no dentist, and he was frequently called upon to perform dental operations. In this way his attention was turned to a profession which he was subsequently to follow with signal success. He made experiments in the manufacture of artificial mineral teeth as early as 1832, and was among the first to use porcelain in that connection. He relinquished the drug business in 1835, and from that time devoted himself entirely to dentistry.

On the occurrence of the California gold excitement, in 1849, Dr. Hayes, in company with others from Buffalo, made the overland journey to the Pacific Coast, where he remained for nearly two years, returning by way of the Isthmus. He immediately resumed the practice of dentistry, more especially in the mechanical department, his specialty being gold-plate working, at a time when gold was the universal base; but his attention was early called to the use of vulcanized rubber as a base, and to the crude apparatus then used for vulcanizing he added a number of improvements of his own invention, and finally perfected the well-known vulcanizer which bears his name. In 1867 he engaged with several gentlemen in the manufacture of dental goods, under the name and style of the Buffalo Dental Manufacturing Company, in which his inventive faculty found free scope. His connection with this company terminated about five years since, when he retired from active business.

At the time of his death Dr. Hayes was president of the Buffalo Society of Natural Sciences, which at a special meeting passed resolutions expressive of regret at the loss of a valued and respected member and a devotee of science, whose blameless life had won for him a high place in the esteem of the community. The society ordered his portrait placed in their library. In his will he bequeathed to this society a munificent legacy. The Eighth District Dental Society of New York, which was in session at the time of his death, also passed resolutions of appreciation of the character and worth of an old and valued member, whose professional ability had been rarely equalled, and whose exemplary life never swerved from the path of integrity. Many members of the society made remarks testifying to his modesty of demeanor, his high sense of duty, his generous instincts, and his inventive capacity. The Buffalo Dental Association also passed resolutions of regret at the death of a member who had long been an ornament and an honor to the profession.

HINTS AND QUERIES.

"He that questioneth much shall learn much."—Bacon.

Correspondents desiring a reply in this department are requested to make use of *distinctive signatures or initials*, and avoid the practice of signing their communications Reader, Subscriber, etc.

Correspondents who wish notice to be taken of their communications should authenticate them with their names. We cannot insert queries or replies except they are so accompanied. Names not necessarily for publication.

Some time since I made a full upper and lower denture for a gentleman aged fifty-six, and in wearing them he complains of the increased flow of saliva,—so much so that it will flow out of his mouth when speaking. Will some one inform me of the cause and give me a remedy for it? The upper plate is made of Bow-spring and the lower of weighted rubber. Would a celluloid plate be better?—Bayonne.

I would be glad to have the opinion of those who have used them of the effects of cheoplastic alloys as dental bases upon the health of those wearing them. Can any one tell of bad results known or suspected to be due to wearing them?—F. M. S.

Can some one inform me how to prevent pink rubber from fading while vulcanizing?—R. V. W.

What are the causes of "teeth-grinding" during sleep, and what are the means to correct it?—Aug. Lambossy.

A lady called upon me some four months since to have two teeth filled with amalgam, and at the time mentioned to me that some ten years previous she had a tooth similarly filled which caused her some unpleasantness. It seems that soon after the filling was inserted the lady partook of some strawberries, and shortly experienced a strong acid taste in her mouth. This continued about three days and passed away, returning however soon after, and continuing almost a month, at the expiration of which time it finally left her. I inserted a large amalgam filling on the distal surface of a second lower molar, and another on the buccal surface of the third molar adjoining. Unfortunately after the lapse of eight or ten weeks an unpleasant acid taste accompanied with a burning sensation commenced, and still continues, to her great annoyance and discomfort. There are no two fillings of any sort touching. I have done work for other members of the family, and in no other case has anything of this sort happened. I will be glad if some of your readers will give me the benefit of their experience, and enable me to save fillings that are in every other respect satisfactory, and likely to save the teeth for a greater length of time than anything else that can be inserted, as the teeth are far too fragile to fill with gold.—W. G.

Having adopted a mode of filling teeth with amalgam with which I have had much success, and never having heard of its use before, I take pleasure in recommending it to the profession. I take any good alloy (not gold nor platinum) and prepare it in the usual way, except that I do not press out the excess of mercury. Having filled the cavity, I take pieces of soft gold foil the size of the cavity and place them one at a time on the surface of the filling, and rub lightly with burnisher until the mercury appears, and so on until the surface is dry; then let it stand two or three days to harden; then finish with tape and burnish.

The result is a beautiful filling which will not tarnish nor corrode.—EDW. HALE, D.D.S.

S. B. C. and W. B. S., in the DENTAL COSMOS for December, 1877, in answer to a query as to why celluloid could not be repaired with rubber, said that it was because the celluloid could not stand the temperature of 320°, necessary to vulcanize rubber. Then, Doctors S. B. C. and W. B. S., why is it being done now (1882)? Please explain.—EUGENE.

PROBABLY most of those who have used the New-Mode Vulcanizer have been annoyed more or less by the rubber-packing to the door squeezing out or blowing out just at the wrong time. They will find that a packing of thick sheet-lead, bedded in litharge and oil and the face smeared with black-lead, will be reliable and permanent. Put the bridge in place and screw up the bolts snugly; then tap lightly on the bolt-heads with a hammer until the bearing is perfect all around, which may be ascertained by removing and examining. There will be no trouble afterwards.—W. E. H.

CRITICISING CRITICISMS.—"Rex," Lincoln, Nebraska, indulges in some pointed criticisms in "Hints and Queries" for August. Allow me to also criticise some of his criticisms. He says:

1st. "We desire to repeat the condemnation which has been pronounced by others against the murderous practice of devitalizing pulps." If he had added, "such as can be saved," he would have been invulnerable in his position; but in the unqualified manner he states it his protestation will not influence any one as it might.

His second criticism on filling roots with gold is all right, and timely.

His third criticism is equally good until he modifies it and says, "A few thicknesses of thin, soft foil as a lining about the walls of a cavity which is to be filled with cohesive gold is to be commended." Not if one knows how to use cohesive gold aright. Then there is no use of non-cohesive gold in the case at all. The suggestion of soft-foil linings never came from practical tests, and is only naked theory. A very small proportion of cavities are so situated that such lining can be kept in place while the cohesive gold is being placed, and if one knows how to handle cohesive gold he will make a perfectly moisture-tight filling with cohesive gold alone. Those in Nebraska or Pennsylvania who do not know how to do this kind of work should visit Indiana; they will be cheerfully shown how it is done.

Criticism No. 4 is all well enough until we come to the last paragraph. In this he recommended Nos. 2 to 4 gold foil. Possibly here is one reason for a demand for soft foil at the edges to prevent leakage. No doubt, with such numbers of foil something is needed. I substitute No. 60, and make a moisture-tight filling with it alone. If any one thinks No. 60 is too stiff, or anything else undesirable for all kinds of fillings, let him first see it used by one who really understands how to manage it; then take the same make of No. 60 that a practical worker of it uses and knows to be good; then use it the same way the successful worker of it does. Until one has done this he is not in a position to condemn No. 60, or to put Nos. 2 and 4 above everything else.

Let "Rex" continue his criticisms. They are exactly what are needed. A great many shams can soon be exploded, if shown up as he has begun, that have lived too long already, and under the old way of treatment might continue indefinitely.—W. E. DRISCOLL.

THE WISCONSIN DIPLOMAS IN GERMANY.—By the aid of the DENTAL COSMOS, which exposed, in the numbers for March, September, and October, 1881, respectively, the fraudulent character of the Wisconsin Dental College, I have been enabled, since my coming to Germany to practice, to render a service to all genuine dental colleges. (The above numbers were useful to the court in Bremen in this case.)

Germany has great respect for all titles, and it is considered very bad taste to omit them in addressing the titled individuals,—even going still farther, and extending them to the wives also. If a man is a Doctor or an Inspector, his wife is addressed as Frau Doctorin or Frau Inspectorin. The Germans have also great reverence for and obedience to law, as well as the customs of their fathers which have been handed down to them, and their conservative ideas are not readily abandoned.

The German laws regulate the rights of professional men in the nation, and the officials whose duty it is to protect those rights under the government are jealously guarding all such rights, and looking after all spurious and fraudulent adventurers who seek to establish themselves in defiance of law. When such quacks are found they are quite sure to be suppressed. I suppose no person in possession of a diploma from one of our long-established dental colleges would be deprived of the privilege of practicing in Germany, but when any individual endeavors to prey upon the reputation of American dentistry here, by claiming and possessing an "honorary" title from such a bogus concern as the Wisconsin Dental College, it is only necessary to visit the chief of the police department and state such facts as are susceptible of proof, when the offender, with his new signs of D. D. S. and his twelve-dollar-and-a-half "honorable" diploma, has to start for a new field. I had the pleasure to start one from the city of Hanover, as well as Bremen, who had established himself with new signs in these cities, qualified with such a handsome "honorary" diploma as the Delavan (Wisconsin) dental professors now issue to those who wish to buy for $12.50 (as I have been told). This bogus college did issue to one Edward Hanft, who knows little or nothing about dentistry, such a diploma, claiming to do so for a valuable discovery made by him in dental science.

It is quite gratifying that it is possible to put these fellows upon the tramp in Germany, and I wish we could be sure they could do no harm to American dental reputation in any other country. It is to be hoped that the State of Wisconsin will soon find a law to punish the contemptible fellows who are guilty of this grave offense. As for such professors, no matter what their skill or ability, they are engaged in a service which can only be criminal in the eyes of the law in any State or nation, and are much more to blame than the dupes whom they profess to help by giving them such diplomas.—H. F. BISHOP, *Hanover, Germany.*

THE

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ORIGINAL COMMUNICATIONS.

BURS IN THEIR RELATION TO PAIN.

BY S. H. GUILFORD, D.D.S., PHILADELPHIA.

(Read before the Odontological Society of Pennsylvania, June 10, 1882.)

The direction of surgical thought to the simplifying of complicated operations, to the rendering of them less protracted as well as more certain in their results, and to their being attended with less loss of vital power, and the conservation of pain both immediate and subsequent, has never been more marked than in the present portion of the nineteenth century. The outgrowth of this study has been the devising of such means for the accomplishment of these ends as the bloodless amputation, the anti-septic method of Lister, the Galvano-Farradic current, the electrical cautery, and last, though not least, the surgical engine. This latter is but beginning to awaken the attention and excite the interest to which its merit entitles it.

In our own profession, which is indeed but a branch of the great surgical tree, the same desire to simplify; to lessen pain; to make durable the results of our labor; to conserve the natural organs where often but the smallest vestige remains, has resulted in the introduction of mechanical appliances and therapeutical methods whose names or number it would be a work of supererogation to attempt to enumerate.

What these appliances and methods have done for us in later years is abundantly shown forth in the wonderful advancement made in the perfection and artistic beauty of the gold fillings of to-day, in the numerous additions that have been made to our store of plastic materials,—each one valuable in its proper place,—and in the improved methods of restoring to beauty and to usefulness the broken-down remains of what were formerly honored and useful members of the dental arch.

While our intensely practical American mind has given special

attention to methods leading to the best practical results, it has not, we fear, given the attention it should to the conditions attending the attainment of these same results.

It is, unfortunately, our lot to be the innocent inflicters of a great deal of pain. To this we are not indifferent, as is sometimes supposed, but only too sensibly alive. The number of our associates who yearly "fall by the wayside," victims to the intense nervous strain and sympathetic accompaniment of our delicate work, abundantly proves this. It may be possible, however, that through our constant contact with suffering humanity we are not as much alive to the reality and intensity of the pain we are inflicting as we should be.

Much has been done of late years by the profession for the alleviation of pain in dental operations, and the amount that the patient is *required* to bear to-day is far less than it was a dozen years ago.

The discovery of the fact that thorough dryness of the part operated upon would greatly diminish its sensitiveness, and the introduction of numerous medicaments tending toward the same end, have been of inestimable benefit to both patient and operator, but there is still another element or factor in the production of pain, the elimination of which, could it be accomplished, would do much toward still further reducing the amount of suffering necessary to be borne in the process of excavating a cavity preparatory to filling.

It is the dental engine bur, in the proper manufacture and use of which, it seems to me, lies so great a power for comfort or discomfort to our patients.

This truth has impressed itself upon me from the fact of there being at the present time so great a variety of manufactures of the instrument in the market, and from my having had occasion to try many of them with a view to testing their respective qualities. The difference in their wearing first impressed me, and after that the different effects they produced upon the patient while being used.

This naturally led me to a careful inspection of their points and cutting-edges under the microscope, with results which were somewhat surprising, and hence my determination to present to you to-night a *résumé* of what I saw, and to show the same to you under the instrument.

Burs, in regard to the method of their manufacture, are of three kinds,—the hand-cut, the stoned, and the machine-cut. Of the two former, we have all kinds and qualities, depending upon the skill or honesty bestowed upon their manufacture. Of the latter, a recent introduction, we have but one quality, owing to the fact of there being as yet but one manufacture of them.

We have also a variety of the hand-cut bur known as the finishing-bur but we do not propose to speak of it, as we are only con-

sidering burs in their relation to pain,—in other words, those used on the inside of the cavity.

According to the popular idea, the main qualities a bur should possess are well-cut teeth and proper temper. So far as the operator alone is concerned, this idea is, in the main, a correct one; but when we come to consider the matter from the patient's stand-point, it does not begin to cover the ground.

A bur may cut rapidly and well, and wear a very long time, and yet be very far from fulfilling the idea of a perfect instrument. To be such, it should both cut and wear well, and at the same time cause the least amount of pain in its use. To this end, other qualities are necessary. Notably, the bur should be true; that is, the center of the cutting-end should be on a direct line with the center of the shank. If the tool is not true, the point in its revolution will not describe a perfect circle, as it should, but, rather, an ellipse, by traveling in an eccentric way. The result of this would be that the head in its revolution, instead of touching the dentine all the while, as it should, would alternately touch and leave it, thus giving a series of raps or blows, producing very decided pain. The operator might not be conscious of this, but the patient would, although there would probably be ignorance as to the cause of it. This rapping or thumping of the tooth in the process of burring, is, to my mind, one of the more prominent causes of pain in excavating.

This same effect is produced, though in a less degree, by irregularity in the height of the different teeth or cutting-edges of the bur. Again, the same result may be brought about, and often is, even where a most perfect bur is used, by operating it in a hand-piece that does not run true. From this it appears that a bur should not only be well tempered and well cut, in order to save our time and expense, but that for the patient's sake it should be true, that the teeth should be of a uniform height, and that it should be operated in a hand-piece so accurately constructed as to carry a true bur in a true manner.

Another element in the production of pain, and certainly a most important one, is the evolution of heat by friction. This is usually produced either by the teeth of the bur being ragged and dull through improper manufacture, or by using a bur after it has become worn and dulled, or by keeping any bur in contact with the tooth too long at a time.

The first can be overcome by not purchasing or using a bur that is carelessly or improperly made. The second and third need only a little watchfulness and care on our part to avoid. We need but think to be convinced of the fact that a sharp cutting-tool, traveling at a velocity varying from five hundred to two thousand revolutions

per minute, will cause less friction and hence produce less heat and pain than a dulled one or one improperly or poorly cut and sharpened.

In this respect a stoned bur (other things being equal) will be far superior to one where the scale of the final tempering has been allowed to remain on the cutting-edges to dull them or impede their progress through the resisting substance.

A dulled bur, no matter what its original make or cost, is the one that is most painful, and for the use of which there is the least excuse. The rounded edges, exposing a greater surface to the dentine in the revolution, and borne down upon by the operator in a vain attempt to make them take hold, generate heat in a very rapid manner, and cause pain in a corresponding degree.

Through inadvertence, I think we all at times use burs duller than we are aware of, and thus unwittingly cause pain.

One of the best ways to avoid this is to lay out a dozen or more new burs at the beginning of each week, and at its close lay them aside to be re-cut.

A bur that has been re-sharpened is, in the very nature of the case, a very imperfect one. Some of the teeth will have been broken or worn more than others, and, while the workman can sharpen them after a fashion, he cannot equalize the height of the teeth.

The machine-cut bur, owing to its manner of manufacture, is the poorest new bur ever introduced. The teeth are of unequal height, and so poorly cut that the edges resemble the teeth of a saw more than a cutting-instrument. It is, therefore, a very poor instrument to use upon a living tooth. Aside from its employment upon living dentine, however, it must be said, to its credit, that, as a rule, it possesses a degree of hardness of cutting-edge that makes it, with the re-cut bur, a very useful and valuable instrument, indeed, for the opening-up of fissures or for excavating in devitalized teeth.

Another variety, known as the "honed" bur, just introduced by The S. S. White Dental Manufacturing Company, is of a grade between the "stoned" and the ordinary bur. The edges and sides of the teeth are carefully dressed and polished after tempering in such a way as to give it very much the appearance of the "stoned" bur, although it is much lower in price.

I have had no opportunity to test this variety, as I have not seen any of them before to-night, but, from an examination, I do not hesitate to say that I shall be surprised if they do not possess all the valuable qualities of the stoned bur.

In order to enable me to examine the accuracy of cut and finish of the bur-heads, I have arranged a small appliance and fitted it to the stage of the microscope in such a way as to bring the bur-head into

the field of vision and there have it revolve, in order that the entire circumference may be in turn examined.

In examining the stoned bur (Fig. 1), you will notice the polished sides of the teeth and the clear and keen cutting-edges. Even the bottom of the furrows between the teeth is smooth and polished, enabling the bur thereby in the very best manner to clear itself in the act of cutting. This latter point is one not to be under-estimated, for when a bur is in a condition to favor the retention of the débris in the furrows, they soon fill up, and thus practically lessen the depth of the cutting-edges, and so far interfere with its usefulness.

The general appearance of the head of the stoned bur shows the care, skill, and labor necessary to its production.

In direct contrast to this most perfect of cutting-tools, I would have you notice the ordinary bur (Fig. 2). When this instrument is well made, the teeth will be of uniform height and shape, and it will be as perfect as the file can make it before tempering; but in the latter process, by the oxidizing of the metal, its entire surface is covered with scales, making it rough and irregular, where, before tempering,

FIG. 1.

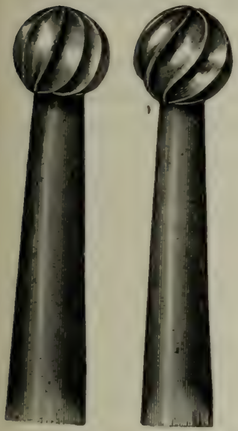

FIG. 2.

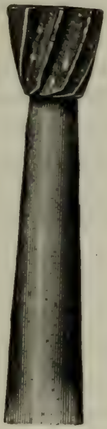

FIG. 3.

FIG. 4.

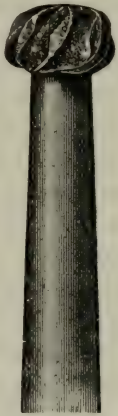

FIG. 5.

it was comparatively smooth. No doubt the file-marks, fine as they are, favor the retention of this scale upon the surface of the metal. You will perceive that not only are the furrows rough from this scale, but the cutting-edges are also made dull and uneven by it.

It is easy to decide as to the relative value of the two instruments.

In the re-cut bur (Fig. 3) you will notice its similarity to the new plain bur so far as roughness from scale is concerned. Its teeth, however, are of unequal length, caused by some of them having been previously broken and their being filed to an edge in their

present shape. This fact makes it one degree worse than the ordinary bur as a pain-producer.

Next, I would call your attention to the worn bur (Fig. 4), and have you notice under the microscope what we cannot so perfectly discover with the naked eye,—its utter worthlessness as a cutting-tool.

Some of the teeth are broken, while others are worn down so as to more closely resemble a burnisher than a cutting-tool. These worn and smooth edges, together with the irregularity of the teeth, make it an instrument that, by heating and thumping the tooth, would cause more pain and do less work than any other.

In the machine-cut bur (Fig. 5), which I show you last, you will notice, in addition to the scale, the general roughness, not only of the cutting-edge, but of every part of the furrow. All its surfaces present the appearance of having been coarsely draw-filed. This is no doubt due to the rough surface of the tool used in cutting them. You will also notice that pieces have been chipped or broken out of some of the cutting-edges. This is probably due to the hard temper of the bur and the lack of delicacy of the tool cutting it. Of the specimens I have just shown you, all are entirely new and have never been used, except, of course, the worn bur and the recut one. The latter has not been used since it last came from the instrument-maker's hands.

The specimens are from different makers, and have been bought at random from the general stock of each maker. There has been no careful selection in any case. In order to show the relative trueness of the various burs, Mr. Starr, at my request, has kindly brought with him an instrument devised by himself and admirably adapted to the purpose. By it you can see at a glance which burs are true and which are not.

From the examination of the subject we have made to-night it will readily be seen what qualities a bur should possess, in order to commend itself to our favor and minister to the patient's comfort. In the first place, it should be made of the best steel, and so treated as to give it the best qualities possible. Next, it should be most carefully made, with keen, even, and regular cutting-edges, and perfectly smooth furrows. It should be well tempered and be perfectly true. The tool-holder or hand-piece in which it is carried must also necessarily run perfectly true.

In selecting our burs we should use a magnifying-glass, in order the better to examine their various points. Having succeeded in getting the proper quality and kind of burs, we should be careful to employ them properly. For the excavating of living dentine we should always use a new and sharp bur, lifting it frequently from the surface operated upon to prevent heating. The best results are

generally obtained by running the bur rapidly. We should watch and see that the tool does not become clogged. This is less liable to occur in a dry cavity than in a wet one. We should frequently examine our stock of burs with a magnifier, and lay aside to be re-cut all those that show considerable signs of wearing.

Lastly, we should be liberal, almost prodigal, in the frequent purchase of the best burs. In this way we not only effect a valuable saving in our own and the patient's time, but add immensely to their comfort and our own reputation.

PROCEEDINGS OF DENTAL SOCIETIES.

AMERICAN DENTAL ASSOCIATION—TWENTY-SECOND ANNUAL SESSION.

SECOND DAY.—*Afternoon Session.*

THE report of the special committee appointed to draft resolutions expressive of the sense of the association regarding the death of Dr. D. C. Hawxhurst, was received and adopted.

Section V., Anatomy, Histology, and Microscopy, was called, and Dr. Cushing stated that owing to the absence of the chairman there would be no report.

Section VI., Pathology, Therapeutics, and Materia Medica, was called, and Dr. Albion M. Dudley reported that the section had passed upon three papers, by Drs. Odell, Rawls, and Harlan, respectively, which they would recommend for reading.

Dr. A. O. Rawls, Lexington, Ky., read a paper, entitled "The Possibilities in Treatment of Pulpless Teeth."

In pulpless teeth there are two tissues more or less intact and devoid of life, viz., the enamel and dentine; two tissues still existing,—one with a possibility of but very slight break in its nutritive continuity, viz., the pericementum; the other with the probability of numerous breaks in its channels of life, viz., the cementum. In the case of alveolar abscess the same tissues, as above, are usually involved in the same manner, and to the same degree, but there are exceptional cases in which this does not take place. These latter cases are those wherein the abscess does not cause destructive lesions at the apex, or apices, of roots of teeth, as when it occurs at the point of bifurcation of roots, upon the sides of roots, etc. Aside from the conditions mentioned, alveolar abscess may involve, in addition to the above, more or less loss of the periosteum and process in the vicinity of its attack, thus leaving the process in proximity to the abscess either partially or completely denuded, or devoid of its proper covering. In all pulpless teeth, whether the

condition is complicated with alveolar abscess or not, there is, of necessity, a break in the nutritive continuity at the ends of their roots. In all cases of alveolar abscess there exists a similar condition in which the nutritive supply is cut off, either from the cementum or the process, at the point of attack.

I believe it is the generally-accepted opinion that there is but one periosteal membrane between process and tooth; also that this membrane is attached to both process and cementum by minute shred-like prolongations or ramifications of its connective tissue, together with nutrient vessels passing into and out of its substance. This being true, any inflammatory process may, according to the location of its cause, result in an abscess which will destroy the connection either between the process and membrane, or cementum and membrane, and may ultimately involve an entire dissolution of more or less of the membrane at the seat of disease. It is to the latter probabilities that we may ascribe the differences of opinion relative to the question as to whether all conditions of this character are abscesses or ulcers, or some are abscesses and others ulcers.

An alveolar abscess which has for its cause a dead pulp generally presents, at some period of its existence, that condition known as a dentigerous cyst or sac. When occurring upon the sides of a root, or in the bifurcation of roots of teeth, it may have the same cyst-like character, but it oftener partakes of the character of an open or superficial ulcer. If the inflammatory process causes a separation of the pericementum from the cementum, but leaves the membrane more or less perfectly attached to the process, the sac-like condition will most likely for a time prevail. On the other hand, however, should the attachments first be broken between the process and membrane, a cyst or sac is not likely to be formed, but, as is more or less frequently the case, the membrane will rapidly melt away and the lesion will present all the characteristics of an ulcerated surface. The physical differences therein are as follows: In the one case we have an open ulcer, with no specially-defined limit or line of action, while in the other we have a more or less closed ulcer, with a more definite demarkation between healthy and diseased tissue. So far as these physical aspects are concerned in the breaking-down of tissue, they probably amount to the same, all things else being equal; but their effects toward assisting or retarding the reparative process would seem to be at variance.

Now, let us recur to the subject proper. You are aware that success in the estimation of some practitioners is not success in the opinion of others. The principal questions here involved are, by what standard do we measure success? and by what should it be measured? I anticipate the answer of some of my confréres by

stating that the standard should be the length of time teeth so treated may be comfortably retained in the mouth. I also anticipate the answer of others by adding to the statement, "and be of service to the patient without detriment to surrounding tissue." My reply to such answers is that they simply imply varying degrees of success in conformity with the toleration of lesions present, by the endurance of the patient or integrity of the part involved. It is of common note that dentists speak of the cure of these cases as though it were absolutely perfect, and similar to the cure of a cut or wound in any external soft tissue. If this is true, *i.e.*, if the lesion is healed in a physiological way, after the manner of healing in other tissues, it must be in one of two ways, viz., 1st, by a complete restoration of lost periosteum or process, or both, to and in their normal condition; or, 2d, by the formation of what may be termed false tissue, which, not being normally nutrified, is much more likely to be broken down.

Let us begin examination by taking for our first case a superior central incisor in which the dead pulp has been separated from the living tissues at the apex of the root by a physiological process. All practitioners will admit the comparative simplicity of such a lesion, and, with myself, acknowledge that if a perfect restoration of at least the periosteum involved can take place about the roots of any teeth so involved it certainly can in a case of the character above mentioned.

Prosecuting an examination into the physical, chemico-physical, and physiological conditions likely to be present in such a case necessarily exacts inquiry in several directions. First of all, the question as to whether the root-membrane in health has any connection with the vessels and tissue passing into the nerve-canal at the apex of the root must be settled. If it has not, then, in case of death of the pulp there is no break in its continuity at this point save by contact and possible irritation of dead tissue of the pulp or other foreign substances. If a connection does herein exist, then death of the pulp breaks it, and conservative treatment will, in so far as this lesion is concerned, be successful in proportion to the degree of re-establishment of nutrient circulation at the point broken.

For the present, however, let us admit the truth of the former condition, viz., that there is no connection between these two tissues at or near the end of the root. It will be much easier for us to argue complete success from such a stand-point.

So much, then, being admitted, we have, in the case under consideration, a simple disconnection at the apex of the root of tissues once passing through to nutrify the dentine and other parts of the tooth. This break has been healed by a separation of the dead from the living tissue in a physiological manner. Now, this would seem to

indicate complete success in an endeavor to save the tooth, and no doubt, if such a result be possible, it can be attained in this case, if in any, by a careful and thoughtful manipulator. But even here we necessarily contend with the possibility, aye, probability, of inorganic or disorganized organic irritants which may remain in contact with vitalized tissue at the end of the tooth after removal of the pulp. Aside from this, in the operation of filling the root-canal, we are brought face to face with two difficulties, viz., that of securing a filling-material compatible with the healthy tissue whose border it should barely, yet actually, touch, and that of placing such material in such position that it would not impinge upon or be distant from this tissue. And yet these are not all of the influences operating against complete and lasting success in the conservation of such teeth. On the contrary, we must admit, even though there be (normally) no continuity of nutrition between dentine and cementum, that an animal substance like the dentine cannot, when deprived of vitalizing sustenance, remain continuously in juxtaposition with living tissue without affecting the integrity of such living tissue in a greater or less degree.

This case, of which I have endeavored to present the characteristics somewhat in detail, is, as you may readily see, one of those most favorable for treatment looking to successful results. Indeed, such teeth, presenting the conditions enumerated in the foregoing pages, are so often saved in usefulness to the patient for a number of years, without apparent detriment to or loss of surrounding tissue, that it would seem like making mountains out of mole-hills to even mention their characteristics. Nevertheless, the same underlying principles herein exist to modify success as are present to bar its probability in similar though more extensive lesions, the difference being only a matter of degree rather than character of conditions present.

Now, let us instance another case wherein exist similar diseased conditions, but presenting more extensive disruption of tissue. You have observed in practice (for I think such conditions common, even in a limited practice) that at times there is a denuding of the root-membrane about the immediate end of the root, consequent, at least, upon continued contact of dead, disintegrating or suppurating tissue. To exemplify, we will take for example an inferior incisor or cuspid tooth, the shape of the root not exactly common to such teeth as a class, and yet very often met with, viz., one with the root flattened laterally, and thus comparatively thin from side to side; the dead pulp has been removed, the root is denuded of its proper covering for, say, an eighth of an inch from its foramen, and the remaining membrane thickened and irritated to the degree of cell-

proliferation for at least an eighth of an inch further toward the crown, and if the membrane is continuous from the point of separation from the root with the process round about the lesion it may be, and probably will be, inflamed to the extent of its separation. However, we may have in such cases a complete destruction of the membrane beneath the end of the root to a point diagonally downward from its point of contact with the root. This relative position of attachment to root and process is due principally to the operation of physical laws. In either event, *i.e.*, whether the periosteum maintains its attachment to the process beneath the end of the root, or, on the other hand, is melted away, you will certainly bear me out in the statement that to secure a perfectly successful re-establishment of, first, contact of periosteum with the part from which it is broken, it is necessary in one instance that there be a gradual development of the process from beneath the periosteum, or a thickening of the latter until its apposition is normally complete with the surface of the cementum; and in the other case, *i.e.*, where the membrane is entirely destroyed beneath the end of the root, that this development of either periosteum, or process and periosteum, take place from the points of attachment to root and process downward and inward toward the apex of the root involved.

This admitted, allow me to call your attention to the fact that still another difficulty, of much graver aspect, must be overcome ere the nutrient current between the cementum on the end of the root and the periosteal source of supply can again be normal to the part. I refer to the difficulty of a formerly organized, though now disorganized, tissue again accepting a physiological union with the newly-developed membrane, and by such union re-establishing organization out of non-affinitative and, indeed, we might say, entirely foreign substances.

Now, if it be true that in these most favorable cases there exists such opposition to the return of the parts to normality, such definite and destructive character of forces to be harmonized ere success be perfect, I ask you what must be expected in cases of alveolar abscess of long standing, in which we would labor to conserve the organ or organs at whose root or roots the lesion is most extensive? I ask you, Gentlemen of this the representative body of our calling in this country, are we not presuming too much at the hands of the *so-called mysterious vis-vitæ*, and reckoning too little of the chemical, the physical, or chemico-physical possibilities in the treatment of these cases?

Dr. A. W. Harlan, Chicago, read a paper on "Hydrogen Dioxide."

When the treatment of alveolar abscess was under discussion before the Section on Diseases of the Teeth in the International

Medical Congress, last summer, Mr. Walter H. Coffin, of London, spoke of the use of hydrogen dioxide, and its efficiency in those cases where no fistulous opening was established, mentioning casually that by injecting the sac with this new agent it could be easily evacuated without coagulation of the contents or clogging the canals at the apices. After some ten months' quite constant use of this remedy, I am induced to present a few observations on the preparation of H_2O_2, and the mode of using it.

As it is not always possible to obtain hydrogen dioxide of sufficient strength to be useful, the following is offered to enable those who may so desire to prepare it for themselves: To prepare hydrogen dioxide small portions of purified moist barium dioxide (binoxide of barium) are gradually added to a cold mixture of one part of sulphuric acid and five parts of distilled water, taking care to prevent the temperature from rising beyond 68° F., and suspending the addition when the liquid has only a slightly-acid reaction. The precipitated sulphate of barium is allowed to deposit, and the liquid is filtered off. It is best to retain the slight excess of sulphuric acid, since the compound keeps better by so doing. The solution thus obtained, which scarcely ever contains over five per cent. of hydrogen dioxide, may be concentrated either by exposing it, *in vacuo*, over sulphuric acid, at a temperature of 59° to 68° F., or it may be exposed to cold and frozen, and the frozen portion removed. The residuary liquid by the latter process will be much more concentrated than that by the former, as hydrogen dioxide does not freeze even at —30° F. If the solution is allowed to evaporate over sulphuric acid, it may happen that bubbles of oxygen will begin to be given off. In this case, the addition of a few drops of sulphuric acid will arrest further decomposition.

The aqueous solution, if not too strong, can be preserved for months if it is kept in a cold place, not exposed to light. Hydrogen dioxide is easily soluble in ether. If the aqueous solution is shaken with ether, the latter dissolves out the dioxide. The ethereal solution is much more stable than the aqueous, and may even be distilled without decomposition. An easy test for determining the quantity of hydrogen dioxide present in any aqueous solution may be made by strongly acidulating the liquid with sulphuric acid, and adding from a burette a solution of potassium permanganate of known strength until the purple tint of the latter is no longer destroyed. In this case the following reaction takes place:

$$\underset{\text{Potassium Permang.}}{K_2Mn_2O_8} + \underset{\text{Sulphuric Acid.}}{3H_2SO_4} + \underset{\text{Hyd. Diox.}}{H_2O_2} =$$

$$\underset{\text{Potas. Sulphate.}}{K_2SO_4} + \underset{\text{Mang. Sulphate.}}{2MnSO_4} + \underset{\text{Water.}}{4H_2O} + \underset{\text{Oxygen.}}{3O_2}$$

Each grain of potassium permanganate used corresponds to 0·108 grains of hydrogen dioxide.

During the past year, in general medicine, renewed attention has been drawn to this agent, and the most extraordinary curative effects have been attributed to it, with what propriety the future will show. It is, for instance, stated that "no physician who has only once tried hydrogen dioxide applied in spray to suppurating eyes or suppurating wounds will ever want to be without it." "Passing a few times across a sick chamber while projecting a spray of a two-per-cent. solution renders the air odorless and pure," etc. To show its antiseptic properties, Guttman mixed nine parts of urine with one part of dioxide and allowed it to remain nine months, and it did not putrefy. MM. Béchamp and Paul Bert have, by a series of experiments, discovered that oxidized water arrests fermentation from the presence of living organisms, but is inert in the presence of amorphous ferments, such as diastase, saliva, pancreatic juice, etc. As it is not improbable that the compound will be more frequently experimented with than before these later investigations, some statements contained in a recent circular of H. Zommsdorf, the well-known manufacturer of chemicals at Erfurt, Germany, will be of interest. He says: "It is occasionally stated that distilled water can contain 'ten volumes of hydrogen dioxide;' this is wrong, and is due to an erroneous conception of the words 'ten volumes' which is attached to the quotation of the article in the price-lists. Hydrogen dioxide in its pure state is a *liquid*, and not a gas, and the 'ten volumes' is meant to convey that the product contains ten volumes of available oxygen,—or, in other words, one measure of the commercial liquid can give off ten measures of oxygen. This corresponds to a three-per-cent. solution of hydrogen dioxide. A 'two-volume' solution would be one which gives off twice its volume of oxygen,—or which contains 0·6 per cent. of $H_2 O_2$. Most of the peroxide of hydrogen in the market is little more than a solution of commercial barium dioxide in dilute hydrochloric acid, and possessing but feeble keeping qualities." At present Zommsdorf's product contains three per cent., or varies but a trifle from that figure. It must be kept in a cold, dark place, in glass-stoppered bottles, which should be small if the consumption of the article is insignificant.

I have always used the aqueous solution in the treatment of blind alveolar abscesses and pyorrhea alveolaris, as I have found the rapid evolution of the oxygen to effect a thorough evacuation of the pus. One may see the thin, frothy contents of a non-fistulous abscess—even though the tooth is in the lower maxilla—gradually escape from the sac beneath, if this agent is used thoroughly. Hydrogen

dioxide is such an unstable compound that it immediately decomposes when exposed to the air or is brought into contact with the contents of the sac, liberating oxygen, which unites with the pus and causes it to escape. The unsatisfied molecules of oxygen mechanically distend the sac, thus forcing the pus from it, and thereby causing its complete evacuation. Such an agent must commend itself to any one for the simplicity of its working, as a ready and efficient means of accomplishing so difficult an undertaking as the removal of pus from around the apex of a lower cuspid or bicuspid, without creating any unpleasant after-effect. In practice, after opening the canal, I at first very gently wash out the canal from whence the pus is oozing, and afterward carefully inject the remedy into the sac, which is immediately distended by the evolution of oxygen, and the complete evacuation of its contents follows. I then introduce strands of cotton saturated with volatile eucalyptus, and tightly seal the cavity. The dressing is to be changed in three days, when, if there is no pus or odor, the canal is to be packed tightly with cotton moistened as before, and sealed with gutta-percha. In a week or ten days the root may be filled, leaving the cavity of decay to be filled when convenient. In some cases it may be necessary to use hydrogen dioxide two or three times, at intervals of three or four days, in order to arrest the production of pus. It is always necessary to adjust the rubber dam over the tooth while treating it or changing the dressing. I prefer the volatile eucalyptus as the after-dressing, on account of its not being escharotic or irritating to such a surface as is presented after the use of $H_2 O_2$.

These brief observations are not offered for the purpose of discouraging the so-called "radical" treatment of latent abscesses connected with teeth, but to place in the hands of careful and delicate manipulators a remedy which will prevent much suffering to the patient if used intelligently. I venture to suggest that $H_2 O_2$ may become useful as a bleaching agent for discolored teeth, as it is now largely used in the arts for bleaching; but, so far, I have not tried it for that purpose. Other uses of this new agent will, doubtless, suggest themselves,—a remedy which, I hope, is to become a valuable addition to our too slender list of efficient therapeutical agents.

Prof. Charles Mayr, Springfield, Mass., referring to the last sentence of Dr. Rawls's paper, would ask him what is *vis-vitæ?*

Dr. Rawls. It is a mysterious force, intangible,—the force of life. As intimated in my paper, I do not believe in it.

Prof. Mayr objected to the use of the term, as unscientific. It is better, more scientific, in the case of wounds, to say that proliferations take place, than to speak of the action of *vis-vitæ*. With regard to hydrogen peroxide: A year ago he had spoken of it in

the Connecticut Valley Dental Society, and had suggested that it might be used to bleach discolored teeth, but when he came to its application for that purpose he had found a difficulty: applied to the inside, it would burst the tooth by the rapid disengagement of its oxygen; painted over the outside, the bleaching would proceed very slowly. This led him to consider what it is that causes the discoloration of the tooth. This is a disputed point. We cannot proceed to bleach until we know this. The supposition which seemed most plausible to him is that the hæmatin of the blood in some way accomplishes it. We need not suppose that the red blood-corpuscles enter the blood; serum contains the same matter as the white blood-corpuscle, but we must know in what form the hæmatin is in the tooth. The antiseptic properties of hydrogen peroxide are probably due to the ozone liberated in its decomposition. As an evidence of this he instanced the fact that in Berlin, some six years since, a gentleman prepared an ozonized water which was excellent for the treatment of wounds on account of its antiseptic properties.

Dr. L. C. Ingersoll, Keokuk, Iowa, said he had been asked by the section to present to the association the subject of Alveolar Abscess. He had already published his views in a series of papers, in which he had treated the various forms of the lesion under three heads: alveolar abscess without ulceration, alveolar ulceration without abscess, and sanguinary calculus at the apex of the tooth. He presumed that it was a fact that no pulp ever dies without establishing inflammation in the peridental membrane. The form in which this disease is manifested varies. It may be an alveolar abscess; it may be an ulceration, or a permanent induration. Ulceration has not been clearly separated from abscess. When it dawned upon him that there was a difference he went to investigating, and he shortly found, in a case that came into his hands, an induration of granular formation at the apex. The question immediately arose, How could the saliva deposit the formation at that point? The little valve by which it might have access was always closed; gravity could not carry it there, because the tooth was in the upper jaw. He had had some of these specimens carefully analyzed, and he found one thing which does not appear in the ordinary salivary calculus,—a dark coloring-matter. This formation is not found in connection with abscess, but, in his experience, always with ulceration. As it could not have come from the saliva, he concluded that it must have been deposited from the blood, and he had therefore called it "sanguinary calculus." We find all the elements which it contains in the blood. We have here a new formation, not derived from the saliva, and he had named it because of its evident derivation from the blood. We have a salivary calculus and a biliary calculus, each derived from

the normal fluids which give them their names. You may call it tartar if you will. Where the two—salivary calculus and sanguinary calculus—are found together, he observes a distinct line of demarkation between the salivary calculus and what he has called sanguinary calculus. He recently had a case in which there was no salivary calculus, but an eighth of an inch of this formation, which is known by its color and hardness.

Dr. C. N. Peirce, Philadelphia. Do you not always in these cases find the alveolar process broken down?

Dr. Ingersoll. Yes; but this formation is far greater in amount than that of the broken-down tissue.

Dr. Peirce confirmed Dr. Ingersoll's position. He had seen cases where there was no possible connection between the formation and the saliva; he finds it frequently, and does not think it should be classed under salivary calculi.

Dr. Geo. J. Friedrichs, New Orleans, asked Dr. Ingersoll how many cases he had seen.

Dr. Ingersoll had seen a great many before he knew anything about the difference between the two classes, and had called them all salivary calculus; since he had observed the difference he has seen, in the last two or three years, probably twenty cases.

Dr. W. H. Morgan, Nashville, Tenn. Have you seen this condition in connection with Riggs's disease?

Dr. Ingersoll. I call this one of the manifestations of Riggs's disease.

Dr. A. O. Rawls. There are two ways by which inflammation can take place in the sockets of the teeth,—from within and from without. If the cause is external it must dip down from the outside; if it is internal it must cut off all the nutrient circulation, and that is based on a want of integrity of the tissues, a want of force which favors that condition. There is no part of the body where these deposits are made except on the surface of the tissues, and they occur only in tissues which have been exposed by inflammatory action. He thinks there must be an opening for the entrance of the disturbing element in these cases. He holds that it is not right, because of a mere difference of color, to attribute the deposits to any other source than that from which ordinary salivary calculus is derived. He apprehended that they were not the results of Riggs's disease, but one of its concomitants, following in the wake of the disturbing element. We teach our patients that we can save teeth so affected,—can cause healthy tissue to grow; but there can be no possible reunion between these parts, because there is no affinity between the disorganized and the organized tissues.

Dr. Geo. Watt, Xenia, O., said the idea of sanguinary calculus was not new. Years ago, with Dr. Martin, he had removed a san-

guinary calculus from the abdominal muscles weighing thirteen ounces. There is nothing mysterious about its formation. All you want is a nucleus, and the rest will come. As to what determines the deposit, he presumes there is some inflammatory action, in the first place, which causes the blood to drop a portion of the mineral matters which it carries. It is easy to explain the origin of salivary calculus. The saliva will hold its lime-salts as long as it holds free carbonic acid in solution, but it is not able to hold them when free carbonic acid is not present, and they are therefore deposited. The incrusting of vessels in which limestone water is boiled is an instance of the deposition of the mineral constituent. When ammonia is present in the mouth you may look out for the deposition of salivary calculus, because ammonia has an affinity for carbonic acid. Dentists sometimes find that after they have scraped off the deposit from teeth affected with Riggs's disease, patients come back to them with the deposits returning. There is nothing singular in this when you think of the facts above spoken of. The deposit of sanguinary calculus is not so clear. Ammonia comes, for instance, from the general breaking down of the system; he believes that it is sometimes given off as an excretion by the salivary glands themselves. The breath is sometimes loaded with ammonia, which is very soluble in water, and thus it becomes the very commonest cause of calculus.

Dr. Ingersoll. It does not seem hard to account for sanguinary calculus when we consider that all the elements met with in such formations are found in the blood. Calcifications are common. All salivary calculi originate really from the blood; their elements are there before they are in the saliva, held in solution in the liquor sanguinis. He has had numerous cases where there was no possible connection with the saliva; hence the deposits could not come from that source.

Dr. T. L. Buckingham, Philadelphia. It is not difficult to build up a chemical theory, but can we reconcile the theory with the facts? We have all the elements of the calculus in the circulation, and the lime-salts may be deposited in a physiological way. If the tissue at the end of the root is dead, and inflammation is set up in the surrounding tissue, you will have the salts deposited by a chemical process. Whenever you have a solid dead nucleus, as a bullet, etc., in the tissue, you will have the lime-salt crystals deposited; not by the physiological or life-force, but by a chemical force. He recognizes that there is a life-force that will build up the tissues, and a chemical force that will tear them down. Some think that the life-force is but a higher form of chemical force; they maintain that there is no other, but they cannot tell how you originate thought. You can say that feeling is but the sense of contact transmitted to the brain;

that light is a "mode of motion;" but how does the brain take cognizance of the contact or of the "mode of motion?" What is law—the law of the State or nation? It is the voice of the people. It has no tangibility, but it has force. To his mind, the true explanation of calculus was that when an inflammation is set up and a portion of the tissue dies, chemical action commences and the lime-salts begin to crystallize about the nucleus formed by the dead tissue.

Dioxide of hydrogen is a combination in which there is little affinity of the elements, and the oxygen is easily released, and acts directly upon the tissue. It oxidizes, as it were, the substance with which it comes into contact. For some time past he had been using, with good results as a bleaching agent, sulphite of soda and borax ground together; the combination had been brought to his notice by Dr. Edward C. Kirk, of Philadelphia. The theory is that it bleaches the teeth in the same way as chlorine, and it has the advantage of bleaching deeper than that agent. The borax decomposes the sulphite of soda, liberating the sulphurous acid, which decomposes the coloring compound through its affinity for oxygen. It is also more permanent in its effects than chlorine, and is a simple remedy.

Dr. W. H. Morgan criticised the expression that had been used of a "pus-secreting surface." He does not recognize that there is such a thing as a "pus-secreting surface." He does not understand that there can be in a healthy subject pus circulating in the body, and unless there is there can be no secretion of pus. Secretion is simply the separation of one element from the others. One organ separates one element from the circulation; another separates another element. Replying to Prof. Mayr's criticism of the term "*vis-vitæ*" as unscientific, he claimed that he could just as readily prove the existence of a vital force as Prof. Mayr could prove that there is a chemical force.

Dr. W. H. Atkinson said that the difference between ulceration and abscess did not appear to be clearly understood. An ulceration is simply the breaking open of an abscess. What is its origin? Tracing it back through the various steps of the process from which it results,—through suppuration, pus-making, inflammation—which is only another name for a burning-up,—we find that it really originates from oxidation of the tissue. In reply to the statement made by Dr. Rawls that deposits of calcareous matter are only made on the surface of tissues, he would mention two instances,—the encysting of trichina and of tubercle, in which the deposits are made in the midst of the tissues.

Dr. C. N. Peirce thought the trouble was possibly due to some local condition. In every case which he has seen the tooth is of an

abnormally yellow color, the tubuli are consolidated, and the usual supply of blood still goes to the tooth, though it is unable to appropriate its proper nutriment. Is it not rational, therefore, to suppose that the elements not used for its nutrition are deposited as an amorphous salt on the outside of the tooth? We do have some pus in these cases, but he thought Dr. Ingersoll failed to establish his idea of the difference between abscess and ulceration.

Dr. Buckingham announced that Dr. W. W. Evans would give a clinical demonstration of the method of working the New-Mode Heater, at No. 111 Gibson House, in the evening, at 7.30 o'clock.

Adjourned.

(To be continued.)

SOUTHERN DENTAL ASSOCIATION—FOURTEENTH ANNUAL SESSION.

The fourteenth annual session of the Southern Dental Association was held in the lecture-room of the Baltimore College of Dental Surgery, commencing Tuesday, August 8, 1882, President E. S. Chisholm in the chair.

The sessions of the first day were devoted to routine business.

Second Day.

The morning session was devoted to clinics in the various departments of practice.

Afternoon Session.

Dr. H. J. McKellops, St. Louis, had had the pleasure, last summer, of hearing Mr. Walter Coffin read his paper before the dental section of the International Medical Congress, describing what has become known as the "Coffin Split Plate for Regulating Teeth." He was so impressed by what he saw and heard of this method of regulation that he returned from Paris to London to have a plate made for his son, a boy of twelve, one of whose lateral incisors had erupted inside the arch. Its action in this case had confirmed him in the idea that it would be a good thing for dentists and patients if the Coffin method were known and practiced in this country. He had therefore obtained a number of the plates which had been used, and had much pleasure in exhibiting them. The apparatus is simple, easily made, though great care must be taken that the impression is exact, and easily applied. Children are not afraid of it, it is worn without discomfort, and it does its work quickly and effectually.

Dr. McKellops then described the Coffin split plate, and the method

of making and applying it; also the regulating apparatus devised by Dr. J. J. R. Patrick, of Belleville, Ill., which he also commended highly.*

Dr. J. M. Riggs, Hartford, Conn., addressed the association, by appointment, upon Pyorrhea Alveolaris. He thought that many writers of the present day who have treated upon this subject mistake effects for causes. Some of these say the loosening of the teeth which characterizes this disease arises from a lack of nerve-energy. This, to his mind, is merely confounding the effect with the cause. As he could best convey his ideas by illustration, he would give an instance out of the many which have come under his observation. A gentleman, a physician, aged thirty-two years, strong and vigorous, with no lack of nerve-energy, calls to have his teeth attended to, with the disease in the first stage throughout the mouth. Upon examination, he observes upon the gum of one of the lower cuspids a dark purplish ring encircling the neck, from one-sixty-fourth to one-sixteenth of an inch in depth; the tooth *in situ* is white and clean. With the aid of the mouth- and hand-mirror he shows the condition to the patient, and, taking up an excavator, endeavors to pass it down between the tooth and gum, on the labial surface. After it gets down a little way the instrument meets with an obstruction, over which, calling the patient's attention to the fact, he carefully guides the instrument until it drops down on the tooth-substance beyond it; then, turning the instrument and pressing it upward, he breaks off a portion of the concretion, which proves to be what is ordinarily called lime-salts, or tartar. That is the cause of the purple ring on the gum, which is merely the outward manifestation of the disease. Take it off thoroughly, polish the surface of the tooth, and in three days' time the gum will show a perfectly healthy color. The condition described is the first stage of the disease, and the treatment given is all that is required for a cure of the case at this time. But take the same man and let him go for ten years without the simple operation detailed. The disease spreads, and causes inflammation of the process and, finally, its absorption,—sometimes on the labial surface for one-half to two-thirds the length of the tooth. It runs its course, the tartar accumulating, all the time following up the line of attack. At the end of ten years what has become of the line of tartar? Sometimes it will be found extending clear around the tooth. Sometimes it will not be found at all; it has done its work,—the tooth is loose, but the concretion is gone, in whole or in part. In this case the

* See Dental Cosmos for September for description of the Coffin split plate and Dr. Patrick's regulating appliance.

patient wants the tooth out, but, he asks, what has become of the tartar? The answer is that the natural acids found in the oral cavity have dissolved it, and it has passed into the stomach or out of the mouth in the saliva. But the tooth is so loose that it is a torment to the man; it lies in its socket, entirely loose, almost ready to drop over. It hurts so that he cannot bear the pain. The tooth is taken out. There is no tartar on it, or very little; there is a little speck near the point that looks like a foreign body; but the point of the tooth—the apex—is as sharp as a needle. After the disease has done its work of separating the tooth from its socket, the destroying agent begins to absorb the tooth at the point, irregularly, causing the sharpness described. Now, because no tartar is found upon the tooth, does that argue that it has never been there? Not at all: the loosened tooth shows simply that it has been there and has been absorbed. The speaker has never seen a tooth in that condition on the point of which he could not show patches or specks; we may not see the tartar, but it certainly once existed there, and has accomplished its work.

Now, suppose we find a patient with all the teeth loosened; he has neuralgic pains in the face, for which medicine seems to furnish no remedy; he has also catarrh, and the malar and nasal bones are all affected. In the third and fourth stages a low inflammatory action pervades all the bones of the face, accompanied by neuralgic pains, extending to the brain itself. In such a case the disease of the teeth intensifies the catarrh. A medical man called upon him for treatment for pyorrhea alveolaris; the patient was also afflicted with catarrh. He cured the pyorrhea alveolaris, and cured the catarrh, too, at the same time.

Another case. A lady called in great distress. Nearly all her teeth were affected, and the discharge was most offensive and abundant; if she lay on her side in bed, the pillow would be covered with large splotches of the discharge in the morning; if she lay on her back, the mass was swallowed, and the result was that the whole alimentary canal was demoralized by the pus, blood, and vitiated secretions. When she arose she wanted no breakfast, only two or three cups of strong coffee and some crackers. She was nearly blind, could only see a great light, and was totally unable to see to read. He told her that the trouble with her sight was caused by the diseased condition of the teeth: that unless that was remedied, she might live three months, but she would die suddenly. He treated three or four teeth at a time at each sitting. This consumed three weeks. The teeth became firm, her appetite returned, her sight was restored, and she was able to walk a mile or two without disturbance. He was called to Brooklyn, where they had a live society, and an infirmary for the

treatment of dental diseases at which members of the society were delegated to attend from day to day. He was invited to give a clinic upon pyorrhea alveolaris, and he told them of this patient, whom he showed to some fifteen members. The woman was apparently in fair health. It was not loss of nerve-energy which started the disease in this case, but the disease caused the loss of appetite and the vitiated condition of the whole alimentary canal. Her physician would have sent this woman to the grave, not recognizing the disease and its management.

He maintains that it is not lack of nervous energy that causes this disease, but the disease will lead to loss of nerve-energy. That small purple ring on the gum of the cuspid in the case first mentioned would eventually have led to the loss of the whole set, if left to work its way unopposed. He had tried in these remarks to controvert the old ideas, and to present the cause of the disease and its treatment as he sees it. You may see it differently; if so, give us your information, in order that we may correct our views, if wrong.

One gentleman says he finds it is only those who are strong and vigorous who have this disease. The speaker finds some cases of this kind; he also finds consumptives who have not a trace of it, but he would take the strongest man in the room and cause a beautiful case of pyorrhea alveolaris in his mouth in three weeks, with a fine cotton thread tied around one of the lower front teeth at the line of the gum. The thread will work its way under the gum, and the gum will become inflamed; it will work its way down between the gum and the tooth, and in the meantime the flour and fine particles of food will also work down under the loose gum, finding a rallying-point on the thread; the mass will become impregnated with lime-salts, and will then begin to harden, and in a very short time you will have an excellent example of the disease under discussion. Patients suffering from salivation fall an easy prey to this disease, due to the action of the drug on the glands and the hard and soft tissues of the mouth, the gums in such cases affording a ready pocket under their edges for the deposits.

When you find a tooth with the characteristic concretion of tartar upon it, the first principle of surgery demands that you clean that tooth thoroughly. Go down beyond the line of the disease, go around the tooth thoroughly, and break up the diseased tissue, and apply tincture of myrrh, and in three days you will notice a marked improvement for the better, and if the patient takes proper care of the teeth the disease will not return. Practitioners should watch the teeth of the young people under their care, and see that the mouth is kept scrupulously clean and healthy.

In reply to a question, Dr. Riggs stated that whenever absorption

goes on irregularly, unless the inflammatory action is extreme, it will sometimes absorb one or two bone-cells, and then skip one or two, and these last, being isolated, naturally die, or become necrosed to some extent. In treating this disease you must break up the line of disintegrated tissue. You must, as it were, transfer your eyesight to the end of the instrument, so that when you strike dead bone you will know it. Live bone will feel smooth and greasy.

It requires some years of experience to treat this disease properly, because you have not your eyesight to aid you, but must depend absolutely upon the sense of touch. With experience, however, you will learn to give a great deal of relief in one of the most annoying conditions to which the teeth are subject. The reason the profession are not familiar with the treatment of this disease is, they fail to recognize it until it reaches its third or fourth stages, and then they treat it by depletion and therapeutic remedies. Some treat it by stippling in acids underneath the gum, thinking thereby to dissolve away not only the tartar, but the necrosed bone. Another writer takes off patches of the diseased tissue, and another a strip of the gum, from wisdom-tooth to wisdom-tooth. This treatment he could only characterize as simply barbarous. The treatment of this disease is purely surgical. Any therapeutic treatment is to alleviate the pain and soreness immediately after the operation.

Dr. W. G. A. Bonwill, Philadelphia, by appointment, addressed the association on the subject of ingrafting porcelain crowns on the roots of natural teeth, illustrating his remarks by diagrams on the blackboard.*

Dr. W. N. Morrison, St. Louis, referring to the method of treating pyorrhea alveolaris described by Dr. Riggs, said he cheerfully bore testimony to the importance of loosening the scales of tartar, and teaching patients the value of cleanliness of the mouth. In his experience he had found that all instruments will occasionally fail to dislodge the deposit. In such cases he used as an assistant a little ring of para gum about an eighth of an inch wide. This was sprung on the tooth at the edge of the gum. If this is done and the ring is allowed to remain a few hours, you will see an entirely new revelation, and you will readily be able to get at the tooth to clean it. He had found it advisable to give patients a practical showing how the brush should be used.

Evening Session.

Dr. F. J. S. Gorgas, Baltimore, read a lengthy paper on "Dental

* Readers of the Dental Cosmos are familiar with the method advocated by Dr. Bonwill, which he has fully described in papers which have appeared from time to time in its pages.

Education," of which the following synopsis presents the leading points:

Considerable discussion has been excited by the various schemes of dental education which have been submitted for the consideration of the profession, and a feeling has long been prominent in the minds of the majority of intelligent practitioners that an educational *system* was urgently demanded. It would be absurd to suppose that every aspirant can be molded into an "educated dentist," if by that term is implied one who has attained the acme of human knowledge in that direction; nor will the ridiculous notion be tolerated that the professional education of a student is complete when he obtains the degree which confers upon him authority to practice. Our early professional studies, at best, give us but little more than the mere elements of truth, the rules for acquiring it, a taste for enjoying it, discipline of our powers, and a certain degree of skill in the use of instruments. The purpose of our professional education is defeated and its value vilely cast aside except we carry out by persistent application these advantages in following life. Those of us who are connected with dental teaching cannot conceal from ourselves that it would be desirable to raise the average level of dental acquirement, skill, and capacity the civilized world over. The question is, What measures will best promote a better professional education? The popular and specious cry for raising the standard of dental education comes frequently from those who know little of its difficulties. We should endeavor to direct or limit progress by consideration of its relative utility. No dental student is the worse for an outlook upon kindred arts and sciences which will help him to establish the true relations of his own, which will supply him with additional facilities and light for its pursuit, and with that training of his intellectual powers afforded by a systematic variation in their exercise. The object of all dental schools should be to supply practitioners thoroughly competent in all common dental matters, able, first, to identify, and then to treat therapeutically and mechanically, the local diseases and lesions of the dental structures; and at the same time free from the entangled mass of prejudice, and error, and deception bequeathed by an earlier age of our art. The dental student, in this country, begins a course of study varying with the habit of his mind, with his power of application, and with his opportunities. One may commence his collegiate course fortified by the skill acquired by a connection with a well-qualified preceptor; another, without such opportunities, may, by more laborious, though slower, methods, accomplish the same results. The speaker was satisfied that he expressed the sentiment of every dental teacher when he said that it is much easier to instruct *de novo* than to

attempt to eradicate erroneous opinions and methods acquired from incompetent preceptors. Unfortunately, no dental school in this country can afford to lose sight of the size of its classes. If it were otherwise, a radical change in the plan of teaching would be demanded.

The paper then urged the importance to the dental student of a thorough knowledge of anatomy, physiology, pathology and therapeutics, materia medica, chemistry, and surgery, more especially as applied to dentistry; from which it passed to the consideration of the establishment of dental schools as departments of universities, and of the question, Do such dental departments possess peculiar advantages for affording a dental education? "The mere establishment of one or more dental chairs in medical schools for the purpose of securing the delivery of lectures on purely dental subjects, and which is not supplemented by the necessary clinical instruction in both operative and mechanical dentistry, would fall far short of the requirement. But the case is materially different when a dental department, as perfect as it is possible to make it in all its appointments, having its distinct dental faculty, its separate infirmary and laboratory, and even lecture-hall, and independent in its government, is established in connection with a reputable university of medicine, wherein the dental student can, if he desires, avail himself of the many facilities which such an institution affords to secure a more perfect knowledge of his particular specialty; thereby acquiring a broader medical education, the benefit of which in the practice of dentistry is beyond denial. * * * The majority of dental practitioners to-day do not question the wisdom of the change from separate dental schools to dental departments connected with universities of medicine, provided such connections are veritable ones and are established on the system alluded to. The only question with some is whether the time has yet come for such a departure. The recognition of dentistry as a specialty of medicine, and the establishment of dental sections in the International, American, and other medical associations, has, I think, definitely settled the question in favor of the present time."

Dr. J. H. Coyle, Thomasville, Ga., also read a paper on "Dental Education," of which the following is a synopsis:

At no time within the history of dentistry have schools for the instruction of its students multiplied so rapidly as within the past few years. To appreciate the effect which this rapid multiplication of dental schools must have on the education of dentists, we must consider the fact that the majority of them are dependent upon the fees received from students. The contest among the schools for large classes may make them factors in the final lowering of the

standard. The test of use is the only proper one to be applied to the studies prescribed in the curriculum of a dental school. It is claimed by those who lean too much to the strictly scientific education that it disciplines the mind and prepares it better to grasp the problems that are constantly arising in a busy practice. This is, perhaps, true, but the experience of the writer and that of others teaches that beyond a broad collegiate education, which should be the foundation upon which the purely dental education is built, any extended study which leads away from the special studies required is so much time thrown away. The American Medical Association has recognized dentistry as a specialty of medicine, but the recognition is based upon the medical qualification. When we examine the medical literature of the day we find almost no mention of dentistry, and we may well be surprised at the so-called "recognition." He took it upon him to state that nowhere can dentistry be properly taught except by dentists. Look at the inconsistency of our medical friends. They organize a dental department of a medical university, and proceed to confer upon graduates what has always been the stumbling-block in the way of their recognition of dentists as medical specialists,—the degree D.D.S. We are recognized by the world at large as a noble profession, but in our efforts to secure recognition by the medical profession we have "given ourselves away." We have harped on this string until we have attracted the attention of the medical schools to the harvest of golden ducats to be gathered in by undertaking to prepare us for the practice of dentistry, and they are proceeding to organize dental departments for this purpose. Where these are honestly organized there may be no difference between the opportunities they offer and those of the purely dental schools for the advancement of students. The writer was persuaded, however, that the highest advance did not lie in the direction of extra education after matriculation. What we want is to begin with educated men. The schools complain of the difficulty experienced in getting students to an average level. Let the profession support the colleges in this demand, and let the young graduate put himself for one year under a competent preceptor. Thus he will have an opportunity to get a practiced eye and an educated hand, which have been the basis of the success of those who have placed their names high on the rolls of dentistry.

Dr. J. B. Hodgkin, Washington, D. C., in his paper took the ground that the separate dental school was the proper place for the education of dentists. Following is the summary of his arguments:

Those who think the proper place for the dental college is associated with and appended to a medical school maintain that the dentist must know enough of medicine—using this term in its ordi-

nary sense—to be able to branch off into gynecology, laryngology, ophthalmology; and he is to get this in a medical school and learn dentistry, too. The average practitioner must needs find out quickly just what learning will make him the best dentist. If those who advocate the idea above outlined would only reflect that not a single man of the whole medical fraternity knows the whole, or even a small part, of the *known* things of that science; that even the great men of the profession of medicine confess themselves deficient in accurate knowledge of what has been gained by others; that the very terminology of some departments is a sealed book to the mass of the profession, they would see how hopeless is the task of getting it all. Our daily life is spent, and must be spent, mainly in shaping cavities, itself a purely mechanical operation, and in filling up those cavities,—strictly mechanical still; in removing calculus, dressing diseased gums, capping exposed pulps; in a word, the things we do when done best are confessedly thus well done by means of a skilled eye and practiced hand. The accurate and so nearly perfect knowledge of our work has been worked out for dentists by dentists. If dentistry is to be taught, it must be taught by dentists. It has been made a great success, in the face of great difficulties and unfair opposition. And now the claim is made that the dental schools as distinctive organizations, teaching a profession widely distinguished from medicine proper, and training men in a work so different in its character, calling for so different an order of talents, —that these shall be merged into the already overgrown M.D. schools. To teach dentistry after the fashion that medicine is taught can only be to its detriment, its injury. Its loss of distinctness in any degree will result in loss of tone, loss of individuality, loss of genuineness. It is a maxim in law that "the dangerous adversary is he of one book;" it is concentration that gives us ability. It is this very narrowness which has made dentistry what it is; it is this very "one-book" principle which has so clearly defined and sharply outlined our profession. I say, beware of leaving it. Diffuseness is fatal to success; a concentration is its life.

Adjourned.

Third Day.—*Morning Session.*

Before the regular session was called, clinics were given, by Drs. W. W. Evans, of the New-Mode Heater, and by Dr. L. P. Haskell, Chicago, of the method of making continuous-gum work.

Drs. McKellops, Riggs, and Coyle were appointed a committee on dental appliances.

Dr. R. Finley Hunt gave a clinical lecture on a method of electroplating rubber plates.

Dr. Hodgkin stated that Dr. Riggs had found a case coming under his special department, and would operate on it at 1 o'clock.

On motion of Dr. Coyle, the association proceeded to the election of officers; the result has already been published in the DENTAL COSMOS.

Adjourned.

Afternoon Session.

Dr. T. M. Allen read a paper, by Dr. W. D. Dunlap, of Selma, Ala., on "Education." The subject of the proper education of dentists demands the earnest consideration of this body, and we are called upon to give our views concerning it in no uncertain tone. Are we doing our whole duty in this regard? Thirty years ago there was but one college devoted to the preparation of dental practitioners; there were at that time some few good operators, but the majority were men who had failed in everything else. The colleges have multiplied, increasing the opportunities for obtaining the dental degree. Some of these are bidding for students by offering half rates or short terms of study, and he feared that in some instances the diploma had been granted without any attendance on lectures. The result is, of course, demoralization. Let us find the remedy for this state of affairs, and apply it vigorously. The honor of the diploma is held too cheaply. We know that two terms of close application on the part of the average student are quite short enough time for learning enough of dentistry to enable him to practice successfully. As one means of raising the standard we should look well to the character of the men we take for students—those who are to be our successors. It would be well, also, to require preceptors to bind students to take two full terms at college. The writer also advocated legislation of a uniform character in all the States.

Dr. Wm. A. Mills differed with Dr. Hodgkin's view that the only requisites for successful practice were a skilled eye and a practiced hand. He frequently found himself fall far short of the requirements because of his not knowing enough of medicine. He thought the college curriculum should be extended to take in a wider range of medical knowledge.

On motion of Dr. Hunt, the subject of Dental Education was passed.

Dr. J. B. Patrick, Sr., Charleston, S. C., read a paper entitled "Fetal Medication the True Dental Prophylaxis." Following is a synopsis:

Tardy, difficult dentition is certainly a factor in estimating the causes of the large death-rate among infants; but it is a popular

error to ascribe the excessive mortality at this period alone to the development and eruption of the teeth. Artificial alimentation is in reality the chief cause, since it has been shown that the death-rate among illegitimate children nourished upon food they cannot assimilate or even digest increases to the enormous figure of eighty per cent. This interference with the digestive process causes disturbances and ultimate impairment of health, producing a demand for the specifics in popular repute, which are another potent cause of death. Still, teething is an undoubted factor which must be considered and accounted for. Whatever retards or interferes with the normal development of the teeth becomes a necessary source of direct danger to the life of the child, and when we reflect upon the influence of the maternal blood upon the growth of the fetus, it may be pertinent to consider whether the maternal organism is not itself at fault; especially in those instances where all the infants in a family suffer in like manner during the critical period of lactation and dentition, and premature decay and imperfect arrangement and development of the teeth in the mother and her relatives point to a constitutional defect, if not a disease, which must be regarded as hereditary. The draft for the materials for the nutrition of the teeth of the embryon must be made chiefly upon the mother's blood, and even where this vital fluid is most richly supplied, a demand is frequently made upon the maternal organism itself, in any direction, wherever the requisite elements most abound, as from the osseous system and possibly from the tooth-substance itself. It becomes, therefore, an important matter to consider whether the true prophylaxis and hygiene of the teeth should not begin in the fetal life, and whether this desirable end is not to be secured entirely through the mother's system, by the direct introduction of tooth-food, so to speak, into her blood. That fetal medication, as we have called it, has sometimes seemingly contravened even a hereditary proclivity to painful or fatal dentition is positive, whether the instances are to be regarded as coincidences, or relatively dependent as cause and effect.

As one of a number of illustrations of his views, Dr. Patrick detailed the case of the wife of a distinguished professional gentleman of Charleston. She was a lady of delicate health, the mother of eight children, the first five of which cut their teeth with great difficulty, their eruption being accompanied by diarrhea, fever, convulsions, etc.; the uncommon feature was the uniform tardiness of eruption, the process never even commencing till the children were more than a year old. A striking change has been evident in the last three. The teeth have erupted at the normally appointed time with great ease, in the face of increased delicacy of health on the part

of the mother. It seemed reasonable to infer that the change should be referred to the influence of precipitated chalk, which the mother had acquired the habit of taking in inordinate quantities, and an occasional dose of magnesia for dyspepsia, from which she suffered; that this alimentation was instinctively suggested and offered the required supply to a blood most deficient in these very elements, the normal evolution of the teeth following the accession of material to the parent's blood in the last three pregnancies appears significant.

In view of the possibility of fetal medication, the true method of cultivating a healthful development and perfect growth of the teeth would appear to be the addressing of our remedies in the form of physiological food to the saccular and papillary stages of their primary development; especially as the teeth are organic but not organized, as the other tissues are, and are therefore not subject to molecular disintegration and constant repair, but receive their primary impress once for all during the histogenetic period of embryonal life.

Dr. J. R. Walker, New Orleans, had long thought the subject one of the most important that could engage the attention of the dentist, and had frequently urged its investigation at association meetings and in written papers. He criticised the term "medication" in this particular; "nutrition" would have been more appropriate. With this exception, he indorsed every word of the paper.

Dr. Atkinson. We have here the presentment of a very important subject, the consideration of which makes it necessary for us to understand the mode of the development of the teeth. The idea of supplying artificial food should be elaborated. The germ is the product of two fluids; it is essentially a new product. In the effort to influence its development, it becomes a question whether it is medication or nutrition. We know that every tissue is alive, and can prove it, but we came to the knowledge only three years ago. When the tissues are fed normally, they will exactly fulfill their mission; if not fed normally, we shall have weakness in some part or other of the organism, depending exactly on the degree of departure from normal nutrition. If the tissues were supplied with proper nutrition there would not be that disproportion between the jaws and teeth about which we hear so much. In the case of pregnancy, the mother should be fed the highest possible to the point of assimilation. No exact rules can be laid down, because of the difference in the standard of what can be assimilated. Give her whatever she wants—slate-pencils, chalk, etc., if they are craved. In the human economy change is continuous; some parts are being worn out, and others renewed, all the time. The correct principle is to keep the mother's system in

good order, and thus enable her to provide the fetus with pabulum. Every molecule breathes for itself, and the mother provides through her circulation for the child's development.

The subject was passed.

Dr. E. Parmly Brown, Flushing, L. I., read a paper, "Thoroughness in Dental Operations," in which he gave the following as his idea of "thoroughness:"

"Thoroughness with us does not mean merely a solid gold filling; nor does it mean a solid gold filling well anchored; nor does it mean a solid gold filling well anchored, with margins perfect; nor does it mean a solid gold filling well anchored, margins perfect, and the living or dead pulp properly treated; nor does it mean a solid gold filling well anchored, margins perfect, pulp-treatment correct, contoured properly according to nature's best example to prevent future trouble and give present comfort, and, withal, finished artistically. Thoroughness means all this, and more. It means that all the tooth-structure exposed to future probable damage be cut away courageously; it means that all weak parts of a tooth left for appearance' sake be embraced by strong supporting gold to prevent future fracture; it means that the work shall be completed so that reasonable care will do the cleansing well, and so that food shall not lodge between the teeth.

"Your work is perfect, but you have not done it thoroughly unless you have done it as painlessly and as rapidly as the best appliances of the day will permit; you have not been thorough to your patient nor thorough to yourself, if the operation has been an agonizing one to both—caused by a clamp moving and crowding the tender gum, when a painless, immovable clamp could have been substituted; you have not been thorough, if you have inflicted unnecessary pain by malleting a tender tooth when the teeth could have been braced against one another by procuring and properly applying the necessary apparatus; you have not been thorough if you have condensed your gold by a slow process, taking two hours, when the means is extant to do the same as well in one hour; you have not been thorough if the saliva has been running out of your patient's mouth, annoying and detaining you, and lessening the power of endurance of the patient, when every drop of it should have run down the throat. Ability to quite or nearly close the mouth should be provided for to permit swallowing at intervals. Aside from the disgusting spectacle of the saliva running out of the mouth, whether it be absorbed by napkins, caught in a rubber bib, or pumped out by the saliva ejector, what must be the physical effect of its loss on the patient, particularly to one of delicate health?

"Finally, in order to achieve continued thoroughness in dental

operations, the schedule of fees must be liberal, or the operations cannot be of a superior quality."

The paper was received, and a vote of thanks was tendered to Dr. Brown by the association.

Dr. W. W. Ford, Macon, Ga., said the statements of the paper were so plain and the facts so true that to discuss them would be like going out to prove that the sun was shining. Thoroughness in operations and proper charges were two important points. The great lack in his section was the nerve to make adequate charges for work done. For himself, he was not willing to spend time, labor, and money to get a profession, and then put his work on a par with that of the rail-splitter. If he has to do that, he will go and join them and do their work; but he would not degrade his profession to that level. Dr. Brown does not know the difficulties that we in our section meet with in this regard. Our country is poor, and there is difficulty in making the great mass of our people understand the real value of the operations we do.

Dr. D. McFarlan, Washington, D. C., said that unless he did charge well he could not do his work thoroughly.

The subject was passed.

Dr. J. B. Hodgkin spoke of the use of nitrous oxide gas in small inhalations (one or two whiffs) as an obtundent of sensitive dentine. The effect of the inhalation is complete immunity from pain for three or four minutes, when the nitrous oxide is again given.

Dr. Walker. You can get the same effect by Bonwill's method of rapid breathing.

Dr. J. M. Riggs had conducted many experiments with nitrous oxide, long before chloroform was introduced, in regard to employing its secondary effects, to quiet sensitive cavities. As you know, after the primary effects of this agent pass off there is what is called a secondary effect, which can be made very useful in the obtunding of sensitive dentine. But, for many years he has used chloroform successfully for this purpose. When he discovers sensitive dentine, he gives the patient a few whiffs of the chloroform, not for its anesthetic effect, but as a sedative. He calls the effect which it produces a secondary effect. He gives it also in the case of sensitive persons when treating pyorrhea alveolaris; it takes off the edge of the keen nervous sensitiveness, which is sometimes met with in this disease. He has also recommended its use to physicians in cases of insomnia. With proper precaution, there is not the slightest danger. The proper way to get its benefits without risk is to take an ordinary handkerchief, and pour upon it a tablespoonful of the chloroform; then just before going to bed breathe it a few times, and stop the inhalation as soon as you begin to feel it. As

soon as the first effects pass off breathe the vapor again two or three times, and then lie down and go to sleep. No one should be allowed to take a bottle of chloroform to bed with him. Such a practice is very dangerous; the patient becomes drowsy, the bottle falls over, the fluid runs over the bed, and the vapor is consequently inhaled till death ensues. You should never lie down to inhale chloroform, and you should use only enough to just feel its effects the second time, as above described. So taken, it is perfectly innocuous.

Dr. Hodgkin thought that he should be remiss in his duty if he did not warn every one—particularly the young men—against the use of chloroform in insomnia. It is most dangerous because of the fearful risk of thus forming the "chloroform habit." The "opium habit" is nothing to this in its danger.

Dr. Riggs. It is the abuse of these things that is wrong. Patients will sometimes, when ordered to take hydrate of chloral, or some similar drug, as a medicine, take the liberty of using it as a daily drink. He was sorry to say that, in his opinion, there are many physicians who do not know how to administer chloroform. He has seen them produce asphyxia, not anesthesia. They hold a sponge, saturated with the drug, firmly over the mouth; as a consequence no air gets into the lungs, and that which they contain is thrown into the sponge in expiration and again breathed in all its impurity. If you will take a handkerchief with nothing on it, and hold it firmly over the mouth and nose and breathe into it five or six times, you will begin to feel oppressed. No one should give chloroform without at the same time giving plenty of atmospheric air. The speaker's method of administration was to take a handkerchief, fold in three corners of it, and turn the fourth so as to form a sort of a hood. Into this the chloroform was placed. He watched the movements of the chest; when the patient inhaled the hood was put over the mouth; when he exhaled it was raised up. He never allowed the patient to breathe into the hood and then re-inhale the air just expelled from the lungs.

Adjourned.

Evening Session.

Dr. R. Finley Hunt read a paper by Dr. H. M. Grant, giving a report of cases occurring in his practice.

The newly-elected president was installed, and the balance of the session was devoted to routine business.

After a vote of thanks to the retiring officers, to the dentists and citizens of Baltimore, who had united in entertaining the visiting dentists, to the officers of the Baltimore College of Dental Surgery for the use of their building, etc., the association adjourned to meet in Atlanta, on the second Tuesday of August, 1883.

On the day following the adjournment of the sessions, the members of the association and their friends were given a very pleasant complimentary excursion, by the dentists of Maryland and the District of Columbia, the steamer Matilda being chartered for the occasion. Annapolis and the government naval school at that point were visited, and a sail down the bay to Tolchester followed, the party returning to the city in the evening.

CONNECTICUT VALLEY DENTAL SOCIETY.

The nineteenth annual meeting of the Connecticut Valley Dental Society will be held at the Hotel Warwick, Springfield, Mass., on Thursday and Friday, October 26 and 27, 1882. The first session will be called at 10.30 o'clock A.M., Thursday.

A. M. Ross, *Secretary*, Chicopee, Mass.

MERRIMACK VALLEY DENTAL SOCIETY.

The twentieth annual meeting of the Merrimack Valley Dental Society will be held at the Parker House, Boston, Mass., on Thursday and Friday, October 5 and 6, 1882, commencing at 11 o'clock A.M. Members of the profession in New England are cordially invited to attend.

A. M. Dudley, *Secretary*, Salem, Mass.

THE DENTAL COLLEGES.

We present the following list of dental colleges of this country and Canada, with the names and addresses of the executive officers.

Baltimore College of Dental Surgery. R. B. Winder, Dean, 140 Park Ave., Baltimore, Md.

Ohio College of Dental Surgery. H. A. Smith, Dean, 286 Race St., Cincinnati., O.

Pennsylvania College of Dental Surgery. C. N. Peirce, Dean, 1415 Walnut St., Philadelphia, Pa.

Philadelphia Dental College. J. E. Garretson, Dean, 1537 Chestnut St., Philadelphia, Pa.

New York College of Dentistry. Frank Abbott, Dean, 22 W. Fortieth St., New York, N. Y.

Missouri Dental College. H. H. Mudd, Dean, 500 N. Jefferson Ave., St. Louis, Mo.

Boston Dental College. J. A. Follett, Dean, 219 Shawmut Ave., Boston, Mass.

Harvard University, Dental Department. Thomas H. Chandler, Dean, 74 Commonwealth Ave., Boston, Mass.

Dental College of the University of Michigan. J. Taft, Dean, Ann Arbor, Mich.

Western College of Dental Surgeons. C. W. Spalding, Dean, 1525 Olive St., St. Louis, Mo.

University of Pennsylvania, Dental Department. Chas. J. Essig, Secretary of the Dental Faculty, N. E. cor. Sixteenth and Locust Sts., Philadelphia, Pa.

Dental Department of the University of Tennessee. R. Russell, Dean, 53 N. Summer St., Nashville, Tenn.

Indiana Dental College. Junius E. Cravens, Secretary, Indianapolis, Ind.

Dental Department of Vanderbilt University. W. H. Morgan, Dean, Nashville, Tenn.

Kansas City Dental College. John K. Stark, Dean, Kansas City, Mo.

University of California, Dental Department. S. W. Dennis, Dean, 33 Kearny St., San Francisco, Cal.

Dental Department of the University of Maryland. F. J. S. Gorgas, Dean, 259 N. Eutaw St., Baltimore, Md.

State University of Iowa, Dental Department. L. C. Ingersoll, Dean, Keokuk, Iowa.

Royal College of Dental Surgeons of Ontario. J. Branston Willmott, Secretary, Mechanics' Institute, Toronto, Canada.

OBITUARY.

DR. CHARLES B. FOSTER.

Died, at Utica, N. Y., September 22, 1882, Dr. Charles B. Foster, in the fifty-third year of his age.

Dr. Foster was born in New Hartford, near Utica. He was the son of the late Dr. Gilbert A. Foster, from whom he acquired the knowledge of his profession as a dentist. He was considered a very skillful operator, had an extensive practice in Utica, and was at one time president of the Fifth District Dental Society. His education, social qualities, and manly character won him many and warm friends. He was held in high esteem in the community in which he lived.

FREDERICK G. WILKES, D.D.S.

Died, at Oneida Lake, N. Y., September 4, 1882, Dr. Frederick G. Wilkes, in the twenty-sixth year of his age.

Dr. Wilkes was drowned in Oneida Lake on the date above given. He was born in Syracuse, N. Y., and had lived nearly all his life in

the vicinity of Oneida Lake. He was a graduate of the New York College of Dentistry of the class of 1877, was one of the demonstrators in that College during the last session, and had been practicing dentistry in New York City for from three to four years. He was regarded as a promising young man in the dental profession.

PERISCOPE.

The Mechanism of the Arrest of Hemorrhage.—The process of the coagulation of the blood is of the highest practical importance in surgical pathology, in connection with the means by which hemorrhage is arrested. In this special relation the process has been recently studied by Hayem, whose previous investigations on the physiology and histology of the blood have supplied important additions to our knowledge. These latest researches of Hayem formed the subject of a recent communication to the Paris Académie des Sciences. They relate especially to the part played by the minute corpuscles to which he has given the name of "hematoblasts," a subject which is of interest in connection with the views of Bizzozero on the influence of his *blutplattchen* on the process of coagulation, to which we lately called attention. Hayem pointed out that Andral, long ago, noted in the superficial layer of blood standing in a vessel, whether pure or mixed with a solution of sulphate of soda, innumerable minute white corpuscles $\frac{1}{500}$ of a millimeter in diameter, around which the filaments of fibrin form. Vulpian, in 1873, observed that some of these filaments seem to proceed from the corpuscles, and Ranvier expressed the opinion that these minute bodies were merely small masses of fibrin, which become centers of coagulation. Hayem, however, believes that the elements described by these and other authors are merely altered forms of the hematoblasts which he described in 1874, and which undergo almost instantaneous change when removed from the body. He has shown that these elements, under abnormal circumstances, possess remarkable viscosity, adhering to one another and to foreign bodies, and that this is the first of a series of changes consequent on which they become the points of origin and of attachment of the filaments of the fibrinous mesh-work. Further, he now shows that all the conditions which retard or prevent the coagulation of the blood hinder the alterations in the hematoblasts, while influences which facilitate the latter also promote coagulation, a method of proof the same as had been previously adopted by Bizzozero. These considerations make it probable that the hematoblasts take an active part in the formation of clot which arrests the hemorrhage from a divided vessel, and of this Hayem now furnishes conclusive proof. Such hemorrhage, rapid at first, gradually becomes slower, and finally ceases. The diminution and arrest cannot be explained by the mere contraction of the wall of the vessel, which, although strong in the arteries, is absent in the veins, and could not by itself close the vessel entirely. The actual arrest is by the coagulation of the blood, although it is not easy at first to see why such coagulation

should occur at the open mouth of a vessel through which a stream of blood is flowing, and in which, therefore, no stasis takes place. If an incision is made into the jugular vein of a dog, and a ligature is placed on the peripheral portion of the vessel, as soon as the hemorrhage has ceased a small clot can be extracted from the wound. This clot has the form of a nail, of which the point penetrates into the lumen of the vessel, while the head rests on the outer wall of the vein. If the coagulum is plunged into a liquid which fixes the elements of the blood, it can be thoroughly examined. The point and middle part are grayish, viscous, and composed of a material partly granular and partly amorphous. The granules are constituted by enormous quantities of hematoblasts, already altered, but still distinct and separate, while the amorphous material results from the confluence of hematoblasts which have undergone still more alteration. The head of the coagulum is red externally, and contains in the center a prolongation of the viscid hematoblastic material, and at the periphery a large number of red globules are contained in fibrillary meshes. In the central portion, which really closes the wound, very few white corpuscles can be perceived. It thus appears that the fibrin is added to an original nucleus, which consists almost exclusively of hematoblasts. The formation of this may be watched in the mesentery of the frog. A small vein having been brought into the field of the microscope, it is divided incompletely by means of the point of a small scalpel. The free flow of blood from it soon lessens, the orifice being narrowed by a mass of elements which collect and adhere at the opening of the vessel. In a few moments the opening is covered by a whitish mass, into which the red corpuscles enter with difficulty. Instead of being formed by white corpuscles, as many observers state, this mass is formed exclusively of hematoblasts, which are arrested during the flow of blood. At the moment at which the hemorrhage ceases, these elements are already considerably altered, and undergo further changes beneath the eye of the observer. This hematoblastic aggregation contains only a small proportion of white corpuscles. These are spherical, smooth on the surface, and not adhesive, since if the observation is prolonged for a short time they may be seen to make their way out of the hematoblastic mass by their amœboid activity. They appear to take no part in effecting the arrest of hemorrhage, and present their normal physiological properties and anatomical characteristics at a period at which the hematoblasts are profoundly altered.

In this process the edges of the wound in the vessel appear to act as a foreign body. The hematoblasts behave in precisely the same way to an actual foreign body which is introduced into the current of blood. A metallic thread was passed into the external jugular vein of a dog, by means of an extremely fine needle, so that scarcely a drop of blood escaped. At the end of two or three minutes the segment of vein traversed by the wire was emptied by means of two ligatures, one placed on the peripheral and the other on the central portion, and was then excised and opened after having been placed in a liquid capable of fixing the elements of the blood. The wire was already covered by a thin gray layer composed of innumerable hematoblasts, individually the more distinct the shorter the time

that the wire remained in the vessel. If the wire was for a considerable time in contact with the blood, the collection upon it had precisely the character of the mass which closes a divided vessel.

Thus the essential part of the process of the arrest of hemorrhage appears to be played by the hematoblasts, which, when they arrive at the edge of the wound, become adhesive and collect on it as they would on a foreign body, and to this collection other similar elements are being constantly added from the current of the blood, until the opening is closed and the flow of blood arrested. The other elements in the blood and the formation of fibrin only participate in the process in an accessory and secondary manner. The blood contains within itself its hemostatic; and if all these elements could be conceived to be absent from the blood, the tendency of hemorrhage to spontaneous arrest would cease.

These facts have an important practical application. Since all foreign bodies alter and retain the hematoblasts, and since an abnormal condition of the vascular wall seems to have the same action as a foreign body, we can understand why intra-vascular coagulation occurs upon a portion of the wall of the vessels or the heart which has been altered by disease. So, too, we can understand the hemostatic action of foreign bodies placed in contact with the surface of a wound, especially powdered or spongy substances, which may serve to collect the hematoblasts of the blood. These elements undergo changes the more rapidly under the influence of warmth, and this Hayem thinks may explain the effect of injections of warm water in arresting hemorrhage; but in this the influence of the vaso-motor system no doubt modifies the result. In animals it has been found that the more slowly the blood coagulates the less readily do the hematoblasts undergo modification. Since these elements may undergo alterations in quantity and quality in various diseases, we can understand that these modifications in the blood may predispose to hemorrhages on the slightest vascular lesion. Hayem throws out the suggestion that hemophilia, the pathology of which has hitherto eluded discovery so completely, may be merely the consequence or, rather, the expression of some peculiar condition of the hematoblasts. He relates the case of a man, aged fifty years, who was almost dead in consequence of an extreme epistaxis, to which he had been liable for thirty years. An examination of the blood showed a remarkable paucity of hematoblasts, which, moreover, underwent changes far less readily than in the normal condition. To this Hayem attributed the obstinate hemorrhage, which for three weeks had been renewed whenever the plugs were removed from the nostrils. He therefore proposed to transfuse a quantity of normal human blood, which, containing active hematoblasts, might restore to the blood its coagulating power. One hundred and twenty grammes of blood were, therefore, injected, with the effect of immediately arresting the hemorrhage. After the operation the plugs were removed from the nostrils, but not a drop of blood was subsequently lost. These facts are certainly remarkable, and, taken in conjunction with those described by Norris and Bizzozero, constitute an important addition to our knowledge of the mechanism of the arrest of hemorrhage.—*The Lancet.*

VIRULENCE OF NORMAL HUMAN SALIVA.—*Experiment No.* 1.—San Francisco, July 6, 1882. Injected twenty-five minims of my own saliva beneath the skin of left flank of each of two half-grown rabbits. *Result.*—Both rabbits were found dead on the morning of July 8. Post-mortem examination at 8 A.M. showed extensive cellulitis, dilatation of superficial veins, and abundant effusion of serum in subcutaneous connective tissue. This serum, and the blood obtained from the heart, swarmed with micrococci exactly resembling those heretofore found under similar circumstances in New Orleans, Philadelphia, and Baltimore.* (*Vide* Special Report to National Board of Health in Bulletin of National Board of Health, April 30, 1881.) One rabbit was still warm, the other had evidently been dead for several hours. The spleen of the first was but slightly enlarged, that of the second was swollen, hard, and dark-colored in patches. No pigment found in either spleen.

A culture-flask containing rabbit *bouillon* was inoculated with blood from the heart of rabbit No. 1. At the end of twenty-four hours the fluid in this flask swarmed with micrococci. A second culture-flask was inoculated from this, a third from the second, and so on to the sixth, twenty-four hours being allowed in each case for the development of the micrococcus.

Experiment No. 2.—July 15. Injected twenty-five minims of above culture-fluid (sixth) beneath the skin of a half-grown rabbit. *Result.*—This rabbit died during the night of July 18, and upon post-mortem examination was found to present the same pathological appearances as in the former experiment,—viz., extensive cellulitis, with effusion of serum swarming with micrococci. The blood also contained the micrococci in abundance; spleen somewhat enlarged and dark-colored; no pigment found.

A new culture was started from the blood of this rabbit by introducing a minute quantity directly from the left auricle into a culture-flask containing sterilized rabbit *bouillon*. As before, this was carried by successive inoculations from one flask to another to the sixth culture, the culture-flask being in each instance placed in an oven, at 100° Fahr., for twenty-four hours, for the development of the micrococcus.

Experiment No. 3.—July 26. Ten minims of above culture (No. 6) was injected beneath the skin of a half-grown rabbit. *Result.*—The animal died at 10 A.M., July 29, and a post-mortem examination was made at once. The subcutaneous connective tissue was, as usual, infiltrated with serum containing the micrococcus, which was also present in the blood in large numbers. The spleen was very large and dark-colored. A portion was removed for microscopical examination, and the remainder left *in situ*, the animal being so placed that it should be dependent.

No pigment was found in the portion first removed, but the presence of black pigment in the portion left *in situ* was verified the following day (removed at 9 A.M., July 30).

Remarks.—The most interesting point connected with these experiments is the fact that my saliva is as virulent now as it was in New Orleans in the summer of 1880, in Philadelphia in January, 1881,

* For details as to method employed, *vide* "Studies from the Biological Laboratory," Johns Hopkins University, vol. ii., No. 2, p. 164.

and in Baltimore in the summer of 1881. Evidently this virulence is not a temporary character due to external conditions. For nearly a year I have been residing in a very healthy climate, and have been free from septic influences such as I suggested in my first paper might account for the marked difference in virulence observed in the saliva of different individuals. This corresponds with what Pasteur has shown to be true of other septic organisms,—*e.g.*, the micrococcus of chicken cholera and the bacillus of anthrax,—viz., that varieties possessing different degrees of virulence breed true when cultivated continuously under circumstances favorable to their multiplication. In the human mouth we have a culture-chamber maintained at a constant temperature, and furnished with a constantly-renewed supply of pabulum, saliva, so that the conditions are more favorable for sustaining the physiological characters of the particular breed of micrococcus present than they could be in any artificially-conducted culture experiments.

How it happens that the micrococcus in one man's mouth possesses just the proper degree of vital activity to kill a rabbit in two days, while that from another man's mouth kills in four days, and that from another does not kill at all, is a most interesting question, and one worthy of the attention of future experimenters. I have elsewhere suggested that the supply of pabulum may be the essential point of difference, and that, under the action of the laws of natural selection, an abundant flow of saliva may favor the development in these minute plants of a capacity for rapid multiplication, a quality which would be favorable to the micrococcus when introduced beneath the skin of a rabbit, and would have a decided influence as to the date of a fatal result. The idea that the virulence of normal saliva is due to contact with ordinary septic putrefactive material—as, for example, in the post-mortem room—is opposed by the fact that putrefaction destroys this virulence, and by the results of inoculations, in rabbits, with the sputa of phthisical patients. I have now performed this experiment a number of times, and have in no case seen any evidence of septæmia resulting from it, while the local effect of such an inoculation is limited to the formation of a small abscess containing a cheesy collection of pus.

The question is frequently asked, How does it happen that man does not suffer by auto-inoculation through accidental wounds, if his salivary secretions are infected by this deadly micrococcus?

The answer is simple. The micrococcus is deadly to the rabbit, an herbivorous animal; but carnivorous and omnivorous animals—man among the number—are not so susceptible to its attacks (*vide* Special Report, *loc. cit.*, for results of experiments on dogs, rats, and fowls).

This difference may be explained in accordance with the laws of natural selection. It is evident that carnivorous animals, and our own savage ancestors, in the remote past, in their combats and struggles for food must frequently have inflicted upon each other bites in which inoculation with saliva and the micro-organisms present in this fluid would inevitably occur. Under these circumstances extermination of species, or a race-tolerance resulting from natural selection (survival of the fittest), would inevitably occur. This tolerance, in man, does not, however, seem to amount to absolute immunity,

for "poisoned wounds" as the result of human bites are not unknown in surgical practice; and if these do not commonly give rise to general septæmia, they not infrequently produce local inflammation of a painful and troublesome character.—*George M. Sternberg, Surgeon U.S.A., in Phila. Medical Times.*

Otalgia from Reflex Dental Irritation.—Otalgia due to reflex irritation is probably of more frequent occurrence than has heretofore been supposed. Not to mention the commonly-observed phenomenon of pain in the ear accompanying acute affections of the tonsil, it is well known, also, as a not unusual and an extremely painful complication of the tubercular, cancerous, and syphilitic disease of the pharyngeal region. The writer has seen two cases where otalgia, due to malignant disease of the pharynx, was treated locally for a considerable length of time before the presence of the cancer was recognized.* Although it is not strange that irritation in other

* "Primary Epithelioma of Tonsil."—New York Medical Journal, April, 1882.

parts of the buccal cavity, equally remote from the ear, should result in the same reflex neuralgic symptoms, it is remarkable that they should occur upon the side *opposite* to the point of irritation. As illustrating the possibility of this, however, the following case possesses interest:

The patient was a finely-developed, well-nourished girl of about twenty, with clear complexion, active circulation, and every apparent indication of robust health. Her family history was excellent, and there was no suggestion of any heredity. She had always enjoyed perfect health, with the exception of an attack of double otitis media at the age of seven. At this time there was a purulent discharge from both ears. Since then has always been slightly deaf in the right ear. The present attack began with pain in the right ear. The pain was constant and throbbing, with occasional paroxysms of lancination, and was much more severe at night. This condition grew worse, producing almost complete insomnia. She was seen four days after the beginning of the attack. Examination with the otoscope revealed both tympani in a healthy condition, with no sign whatever of inflammatory action either of the external or of the middle ear. Rhinoscopic examination failed to discover any cause in the pharynx, both the tonsils and the parts in the retro-nasal space being remarkably free from hyperemia. The upper teeth were perfect. In the lower jaw the right second molar was slightly carious, while the right wisdom-tooth had not yet made its appearance. On the left side the the wisdom-tooth was through, but the second molar was wanting. Patient stated that several years ago this latter tooth had decayed and come out. Application of heat and anodynes to the affected ear gave temporary relief, but their good effects never lasted more than three or four hours. The otalgia was apparently reflex, and seemed due, in all probability, to irritation from the developing wisdom-tooth of the right side, or from the carious second molar of the same side. The patient was seen in consultation by Dr. Samuel Sexton, who agreed with this hypothesis. At this suggestion she was referred to a competent dentist, who discovered that the deficient second molar of the left side had only lost its crown, while the roots were still impacted in the jaw, although completely covered by mucous mem-

brane. With considerable difficulty three large roots were removed. At the extremity of one of these a sacculated abscess of extraordinary size was found. The wound caused by the removal of these fragments soon healed, and the otalgia quickly disappeared. Since the operation—two months—the carious right second molar has not been filled, nor has the right wisdom-tooth yet completed its eruption. Nevertheless, there has been no return of the otalgia whatever.

Few instances, if any, have been reported where irritation, not only far removed, but actually upon the side opposite to the neuralgic manifestation, has resulted as in the case above. As yet, from the almost immediate relief which followed the operation, there can be no reasonable doubt as to the relation of cause and effect between the alveolar abscess and the neuralgia.

It appears, therefore, that a disordered condition of the teeth may exert a powerful influence upon parts with which they seem to have but little nervous connection, and the inference is forced upon us that in many cases of cephalic neuralgia the true cause lies in dental irritation, so that relief is not likely to be afforded until the irritation has been removed.—*Bryson Delavan, M.D., in American Journal of Otology.*

Scurvy.—I was struck by two independent observations which occurred in your columns last week with regard to the etiology of scurvy, both tending to controvert the generally-received opinion that the exclusive cause of that disease is the prolonged and complete withdrawal of succulent vegetables from the dietâry of those affected.

Thus Mr. Neale, of the Eira Arctic Expedition, says: "I do not think that spirit of lime-juice is of much use as an antiscorbutic; for if you live on the flesh of the country, even, I believe, without vegetables, you will run very little risk of scurvy." Dr. Lucas writes: "In the case of the semi-savage hill tribes of Afghanistan and Beluchistan, their food contains a large amount of meat, and is altogether devoid of vegetables. The singular immunity from scurvy of these races has struck me as a remarkable physiological circumstance, which should make us pause before accepting the vegetable doctrine in relation to scurvy." These observations do not stand alone. Arctic voyagers have long pointed out the antiscorbutic properties of fresh meat, and Baron Larrey, with regard to hot climates, arrived at the same conclusion in the Egyptian expedition under Bonaparte, at the end of last century.

The question now arises, How is it that tropical and arctic experience is at variance with that acquired in Europe? The only explanation that occurs to me is the different circumstances under which the meat is eaten. As is well known, the reaction of freshly-killed meat is alkaline, from the presence of neutral sodium phosphate; after rigor mortis has passed off it gradually becomes acid, owing to the formation of lactic acid, which converts the neutral into acid sodium phosphate, thus:

$$\underset{\text{Neutral Sodium Phosphate.}}{HNa_2PO_4} + \underset{\text{Lactic Acid.}}{C_3H_6O_3} = \underset{\text{Acid Sodium Phosphate.}}{H_2NaPO_4} + \underset{\text{Sodium Lactate.}}{NaC_3H_5O_3}$$

Now, in hot climates meat has to be eaten so freshly killed that no time is allowed for the development of the lactic acid; in arctic regions the freezing arrests its formation. The muscle plasma therefore remains alkaline. In Europe meat is invariably hung, lactic acid is developed freely, and the muscle plasma is consequently acid. If therefore scurvy is, as I have endeavored to show ("Inquiry into General Pathology of Scurvy"), due to diminished alkalinity of the blood, it can be easily understood that meat may be antiscorbutic when fresh killed or frozen immediately after killing, but which may become scorbutic when these alkaline salts have been converted into acid ones by lactic-acid decomposition.

In conclusion, Mr. Neale is to be congratulated on his valuable and practical suggestion as to the use of the blood of the animals killed for food as a prophylactic in scurvy. The blood being so rich in alkaline salts, no better natural antiscorbutic can be employed, if the view be accepted that scurvy depends upon a diminished alkalinity of that fluid.—*Charles Henry Ralfe, in The Lancet.*

Ranula Occupying the Whole Floor of the Mouth—On October 15, 1874, Matilda L., aged forty, a married woman, residing at Herne Hill, applied at the Cancer Out-Patient Department for an affection of the mouth, which she had been given to understand was a cancer. On opening her mouth the first appearance gave the impression of a large tongue tied down to the floor of the buccal cavity in front, but which, owing to œdema, was bulging above the level of the lower teeth. On looking further into the mouth, however, the tongue itself was seen pushed upward and backward by a large mass, to which the tongue looked but as a small flap-like appendage. The tongue could be protruded out of the mouth at will. The mass, which proved to be an ordinary ranula of extraordinary size, had first shown itself ten months ago as a small bladder-like enlargement on one side of the frænum. This had continued to grow, up to the time of her application to the hospital. At this time it occupied the whole floor of the mouth, pressed backward the tongue, and reached higher than the teeth level; it was soft, but not fluctuating, and at one spot on the left side the surface of the mucous membrane was broken. This destruction of mucous membrane was such as might have been caused by the puncture of a nævus-needle, the edges of which puncture had subsequently ulcerated. There was no induration or tendency to fungate about them. There was no enlargement or hardening of the submaxillary or lingual glands, nor of any of the cervical lymphatic glands. The swelling gave no pain, but caused much discomfort by its size. A cut was made into it with blunt-pointed scissors, and after the contents were evacuated a small square-shaped piece of the wall of the cavity was cut away. The cavity was then stuffed with several long narrow slips of lint, some three or four of which were soaked in the tincture of the muriate of iron. The contents were of the usual glairy character, but somewhat pale; they looked exactly like the white of egg, and measured one fluid ounce. On heating a little, the whole of the heated portion was converted into a solid mass. After cutting away the fragment of the cyst-wall, some slight hemorrhage followed, which soon subsided before the plugging was commenced.

October 23.—Teeth quite black from use of tincture of iron. A large granulating cavity in floor of mouth, with spacious quadrilateral aperature, through which patient can stuff large flakes of cotton-wool into the cavity.

The cure was uninterrupted. The cavity closed by granulating and subsequently contracting.—*Medical Times and Gazette.*

Crural Neuralgia Affecting Dentists.—On June 20th I was called to a gentleman said to be suffering severely from sciatica. The patient was resting on his right side complaining of intense pain in the left loin, radiating thence along the outer and anterior aspect of the left thigh whenever he attempted to move. Firm pressure, applied between tuberosity of ischium and great trochanter of femur, was painless, but the instant one touched the skin immediately over the erector spinæ muscle severe pain was evoked, extending down the thigh to the knee-joint, mapping out exactly the course of the anterior crural and external cutaneous nerves. Pressure over the points of exit of the second, third, and fourth lumbar nerves from the spinal canal caused excessive pain. The nerves at fault were clearly the second, third, and fourth lumbar, the hyperesthetic area in the loin clearly corresponding to the distribution of the posterior divisions of these nerve-trunks. The case was obviously not one of sciatica, but crural neuralgia, having a very unusual distribution; the ordinary forms of this disease extend to the foot and toes of the affected leg. Belladonna and aconite were applied locally, strychnia internally; the patient was convalescent in seven days.

Two days later a similar case came under my notice, and a third has been reported to me with exactly similar symptoms. Curiously enough, the three patients were dentists engaged in the active duties of their profession. It appears exceedingly probable that this painful affection may be explained by the fact that when dentists operate they always stand to the right side of the patient, consequently, when manipulating cavities in teeth difficult of access, it is necessary to throw themselves into a constrained attitude, whereby the lumbar vertebræ are slightly flexed anteriorly, but flexed laterally to a considerable degree. It is necessary sometimes to maintain this cramped position for long periods, the temporary distortion being even more exaggerated when the dental engine is being used. These combined flexions cause the lumbar nerves to become congested, irritated, and possibly injuriously nipped as they pass through the intervertebral foramina, thus giving rise to the symptoms detailed above.—*J. B. Sutton, L.R.C.P. Lond., M.R.C.S., The Lancet.*

Fracture of Lower Jaw.—George S——, aged five years, was admitted into the hospital on July 20, 1881, suffering from a fracture of the lower jaw. The fracture, a compound one, was situated between the right canine and bicuspid. Treatment at first consisted in adapting the fractured ends by means of wire attached to the teeth. This, however, proved futile, owing to the wire, which was too thin, breaking. A four-tailed bandage was then tied, but the lad, being of a restless disposition, continually succeeded in displacing the fractured ends, until a large piece of bone, three-quarters of an

inch wide and an inch in length, constituting one of the fractured ends, necrosed. It was now impossible to keep the jaw in good position by ordinary methods, so a fresh operation was decided on.

On August 19 the lad was anesthetized and Thomas's operation of wiring performed. This consists in first extracting any loose teeth situated at the seat of fracture, and then drilling the jaw on both sides of the fracture, introducing silver wire from the outer side into one of the newly-drilled openings and out through the other. The fractured ends are then drawn together and two simple coils, so arranged as to admit of easy tightening, left between the cheek and gums. Three weeks elapsed and still there was no attempt at union, and in a few days an abscess pointed beneath the chin, which required an incision. On October 26 he was made an out-patient; the abscess healed, but, withal, no union. On November 12 the coils were undone, without extracting the wire, for the purpose of separating the fractured ends and rasping their edges. This accomplished, the coils were once more tightened so as to place the fractured ends in apposition. In three weeks more union was complete and the wire removed.

During the whole of this treatment the little patient was permitted to talk and walk when and where he wished. While in hospital his diet was limited to liquids, and his relatives, when the child was made an out-patient, were urged to continue the same precautions. After the last operation, however, his mother confessed to his having done justice to the family meals from the third day after wiring to the date of recovery. During the uniting process it is necessary to tighten the slackening wire about once a week—a very easily performed task, and one in no way painful to the patient. In this case the only deformity is the unavoidable one of a protruding upper jaw, due to the loss of bone from the inferior maxilla.

By the ordinary methods it was quite impossible to keep the jaw in line after necrosis caused so large a gap. Even were other conditions more favorable, the restless disposition of the child was an active reason for continual displacement. The fact that in three days after the last wiring he was able to masticate potatoes, and even bread, bears ample testimony to the effectual mode in which by this method the fractured ends can be guarded against movement. The operation itself is comparatively a painless one—an anesthetic being rarely required—and generally speaking no difficulty is experienced in its accomplishment. It insures better adaptation, and a less easily disturbed one than other methods, besides affording the patient very much more liberty, and securing him against the hideous display of drapery inseparable from most other appliances. To those desirous of immediately attending their usual avocations this is distinctly a consideration.—*Stanley Hospital Reports*, in *The Lancet*.

Recurrent Epulis.—Mr. Gaddes read notes of a case of recurrent epulis, which gave rise to a good deal of discussion. A girl was sent to the National Dental Hospital on account of a tumor about the size of a bean, which bled frequently and was connected with the first right upper molar. Under gas and ether the tooth and the bulk of the tumor were removed. The growth proved to be a round-celled sarcoma, very vascular, and attached to the periosteum of the

buccal roots of the tooth. In the course of a few days a mass of granulations appeared, filling up the space recently occupied by the tooth. In spite of several applications of nitric acid this mass rapidly increased in size, and at the end of three weeks it was evident that something more must be done. Gas and ether having again been administered, Mr. Gaddes removed the whole of the outer alveolar plate with the hyperplasia, and then gouged away the socket of the tooth with the gum-tissue nearly to the floor of the antrum, care being taken not to interfere with the adjacent teeth. This had the desired effect; the wound healed soundly, and when the patient was last seen, four months after the operation, it was difficult to believe, from the appearance of the part, that so much of the bone had been removed.

Mr. S. J. Hutchinson thought that dental licentiates were not justified in undertaking the treatment of such cases as this. The dental license only entitled its possessor to practice dental surgery, and if he wanted to practice oral surgery he ought to become fully qualified as a surgeon. He was himself an M.R.C.S., but, practicing simply as a dental surgeon, he was always in the habit of referring such cases to a general surgeon or a general hospital, and he thought that this was the proper course to pursue.

Mr. F. H. Weiss said he was not prepared to assert that they would have acted as they had done if they had known the exact nature of the case from the beginning; but it looked at first sight a very simple one, and it was only after the first operation that they found out with what they had to deal. He suggested that it would be a good thing if the society would express some decided opinion as to what should be considered to be the limits of dental surgery.

The discussion was continued by Mr. Stocken, who thought that the duties of the dental practitioner should include the treatment, both local and constitutional, of all diseases arising from or connected with the teeth; by Mr. R. H. Woodhouse, who thought they would do well to confine their attention to the care of the dental tissues, since, besides the risk and trouble involved in the treatment of such cases as that described by Mr. Gaddes, such practice would probably cause ill-feeling between the dental and surgical professions; and by Mr. Lawrence Read, who thought that an expression of opinion on the subject by the society was inadvisable, since it could have no power to enforce its decision, and the probability was that members would continue to conduct their practices according to their own ideas. This appeared to be the general opinion of the meeting, and the matter dropped.—*Proceedings Odontological Society of Great Britain, Med. Times & Gazette.*

Ranula.—In the *Medical Times and Gazette*, April 1, 1882, Dr. C. B. Lockwood offers the following note on a case of ranula. It seems to be generally agreed that in almost every case of ranula the cyst has no connection with the ducts of the salivary glands. This point is supposed to be proved by the fact that in nearly all cases a probe can be passed into the submaxillary (Wharton's) duct, and no communication discovered between it and the cyst. This method seems to exclude Wharton's duct in a satisfactory manner. There are other salivary ducts in the immediate proximity to which

it cannot be applied. There is no particular reason why the ducts of the sublingual glands should not be capable of distention and conversion into ranula. E. W., aged fourteen, presented herself with a very large typical ranula beneath the right side of the tongue. It had only been noticed two months. The submaxillary ducts were not probed, but appeared free, and discharged ordinary thin saliva. A large piece was snipped out of the cyst-wall and the contents saved. They consisted of about two drachms of a very tenacious, yellow, transparent fluid, of faintly alkaline reaction. A portion was found to be soluble in distilled water, from which it was precipitated white and opaque, by the addition of acetic acid. Solution of perchloride of iron produced no claret-colored reaction; it may therefore be inferred that no sulpho-cyanide of potassium was present. Added to starch solution, and kept for some time at a gentle heat, no conversion into glucose was discovered; the fluid, therefore, contained ptyalin; it now appeared to consist of almost pure mucin.

It might be argued that the contents of this ranula may have come from a salivary gland, but have been so long in the cyst as to have become inert. If it had been originally saliva, great condensation must have occurred, and it might therefore be expected to have been made more active than usual. Moreover, these ferments do not lose their activity when kept for very long periods. A glycerine extract, for instance, remains active for an indefinite period.

It seems probable that the cyst in this case was due to the distention of one of the sublingual mucous glands.—*Med. & Surg. Reporter.*

Hemorrhage and Gangrene from a Carious Tooth.—In the St. Louis *Medical and Surgical Journal* Dr. William A. Byrd reports the following case: He was called to see a boy between seven and eight years of age, who was suffering from gangrene of the left side of the face and neck, accompanied with severe hemorrhage. The child was very anemic, with the left side of the face swollen, with an opening that would admit the point of a finger opposite the submaxillary gland, another in the meatus auditorius, and another in the mouth opposite to the outside of the first molar tooth; from all these openings was flowing a dark, very offensive fluid, mixed with arterial blood, and also shreds of gangrenous connective tissue protruded from them. For some weeks the child had suffered from an offensive discharge from the left ear; and about two weeks before he was seen the first left molar tooth commenced aching and the jaw to swell. Subsequently a black spot appeared opposite the tooth, and at this spot the skin gave way, giving vent to a dark, very offensive discharge. The swelling from the ear and the tooth coalesced and the abscess broke into the ear and mouth, causing a profuse discharge from each. In a day or two blood was freely discharged from all three openings. The patient was etherized, and it was discovered that the bleeding came from so many points that it would be impracticable to secure all of them without too great a loss of blood and shock to the patient. It was therefore decided to ligate the common carotid, which was done with catgut. Through the incision a great quantity of gangrenous matter was removed as high as above the zygoma and down nearly to the clavicle. The cavity

was carefully washed out with a solution of boracic acid and packed with oakum soaked in eucalyptol and vaseline. He rallied well and seemed brighter, but sank again, and died on the second day. Dr. Byrd thinks that the carious tooth was the origin of the trouble, and that if it had been attended to in time the result would most likely have been different.—*Medical and Surgical Reporter.*

Extraction of Teeth of Pregnant Women.—Among other casual communications, Mr. Henry Sewill brought forward a question as to the advisability of extracting the teeth of pregnant women. Such patients were constantly applying for relief, but when extraction was proposed—it being evident that the tooth was past saving—one was met with the answer that the patient's doctor did not consider that it would be safe for her to undergo the operation; so the patient continued to suffer, and her strength was reduced by the pain. His own opinion was that this was a sort of prejudice very much on a par with the idea that it was dangerous or wrong to extract a tooth during the acute stage of alveolar abscess; his practice was, during the early stages of pregnancy, to give gas and extract the tooth. In more advanced cases one must be guided somewhat by circumstances, but even in most of these he believed that extraction did no harm. Even if the patient was weak and nervous, the slight shock of the operation did less harm than the exhaustion produced by long-continued pain.

Messrs. F. Canton and A. Coleman said they were frequently asked this question, and never hesitated to answer it in the affirmative. They preferred to give gas in such cases, and took care to give it thoroughly. They had never seen any harm result from the extraction of teeth under these circumstances.

Mr. George Wallis said he never hesitated to operate when an operation was necessary. It happened on one occasion, in the case of a lady who was very near her time, that the child was born within twelve hours after the extraction; but she had been in great pain previous to the operation, and she had a much easier labor than she would have had with an aching tooth to add to her other troubles. —*Reports Odontological Society of Great Britain in Med. Times and Gazette.*

Removal of the Superior Maxillary Nerve for Neuralgia. —At a recent meeting of the New York Society of German Physicians, Dr. Gerster showed a patient who had suffered from facial neuralgia for many years, probably induced by extreme degrees of heat and cold to which the man had been exposed by plying his trade as an oven-builder. In 1877 Dr. Mott divided the nerve, but the pain returned after a short time. In 1878 Dr. Hassloch gave large doses of salicylic acid and quinia, with but temporary benefit. Subsequently Dr. Weir brought about a remission of three months by subcutaneous injections of $\frac{1}{96}$ gr. of aconitia, repeated every two hours. Dr. Gerster then proposed and performed Langenbeck's osteoplastic section of the superior maxilla, with displacement of that bone and removal of the nerve. Two incisions were made,—the first along the lower border of the malar bone, beginning in the nostril and terminating at the middle of the zygoma; the second

beginning at the nasal process of the frontal bone, following the lower margin of the orbit, and joining the first incision on the zygoma. The masseter was dissected from its attachments, and the soft parts were separated from the bone as far as the pterygo-palatine fossa, and, by means of a key-hole saw, the superior maxillary bone was divided parallel to the hard palate and into the nose. The infra-orbital nerve was now exposed in the line of the upper incision, and cut through at its exit from the infra-orbital foramen; after this the eyeball was pushed upward, and, the key-hole saw being introduced through the infra-orbital fissure, the zygomatic arch was cut through. The floor of the orbit was now carefully chiseled through, care being taken not to injure the lachrymal duct, and, by introducing a lever into the cut in the malar bone, the exsected piece of the bone was turned out, hinging upon its soft attachment to the nasal and frontal bones. Thus, the nerve glided out of the infra-orbital canal, and was cut away at the foramen rotundum. The wound was now disinfected with an eight-per-cent. solution of chloride of zinc, the bone was replaced, superficial sutures were applied, and after six weeks the wound was healed. This method was preferable to the one practiced by Carnochan, as it gave ample room for manipulation, and a very clear insight.—*New York Medical Journal.*

Dental Tumor of Jaw.—In the *Canada Medical Record* Dr. C. E. Nelson relates the case of a girl of fifteen, who was suffering from a large tumor of the lower jaw, which had been steadily growing for about six months. For four months the pain had been so severe that morphia had to be used continuously. A distinguished surgeon diagnosed malignant disease, and advised immediate removal of the tumor, along with a considerable portion of the jaw-bone. The day before the proposed operation a dentist was consulted, who, after a careful examination, came to the conclusion that the tumor was not malignant, but was caused by the presence in the jaw-bone of several of the second teeth, which had not yet been evolved. The tumor was freely opened, a quantity of extremely fetid matter was discharged, and the pain was instantly relieved. A probe revealed that the anterior surface of the bone below the incisors had been absorbed, and at the bottom of the cavity so formed several hard bodies could be felt imbedded in the bone. The cavity was cleaned out and packed with lint soaked in a solution of chloride of zinc. Antiseptic applications were used regularly, but the wound continued to discharge a thick, black, and very fetid fluid. By the end of six weeks three teeth could be distinguished, viz., the right canine and two right incisors, and at the end of three months these teeth were extracted through the opening made when the tumor was lanced. A year afterward the cavity had filled up and the jaw returned to its normal shape.—*Medical and Surgical Reporter.*

Choked by a Tooth.—In the current number of *The Dental Record* Mr. N. Miller records with praiseworthy candor a fatal accident that occurred in his own practice. A strong, healthy boy of between ten and eleven years of age was brought to him for the extraction of several temporary teeth, which were obstructing the regular eruption of the permanent ones. The father of the lad

requested that he might have nitrous oxide gas. The boy took the gas freely, and became unconscious in from fifteen to twenty seconds, and seven temporary teeth were then extracted, the last being a left lower molar. "Toward the latter stage of the operation the gag slipped and the mouth closed; the patient became partly conscious, assuming a natural color, when he took a deep inspiration, immediately after which he exhibited symptoms of asphyxia, and, raising his hand to his neck, he attempted to tear away his garments, though they were loose." Mr. Miller placed the patient's head across his knee, gave him some sharp slaps on the back, and told him to cough; he then tried to feel the tooth, but could not. Leaving the boy with his father and an assistant, Mr. Miller went for a medical man, and returned in about seven minutes, to find the boy dead. Tracheotomy was at once performed, but without avail. At the necropsy the missing lower molar was found firmly fixed in the larynx, with the fangs uppermost. This tragic case is full of instruction. In such operations as this appears to have been there is a great tendency to think only of rapidity, and of getting the teeth extracted before consciousness is regained, and it is very easy to omit precautions which should prevent any such accident as this. An extracted tooth should never be left in the mouth, certainly not in a closed mouth. But apart from this, there is the consideration that had the boy's trachea been opened at once, instead of after seven minutes, his life would in all probability have been saved. The case therefore forms a very strong argument in favor of the view that dentists should be surgeons first and dentists afterward.—*The Lancet.*

A New Danger in Anesthesia.—Dr. George Fischer, in the *Deutsche Zeitschrift für Chirurgie*, 1881, vol. xv., p. 188, relates a case illustrating a curious and novel danger in anesthesia, which, so far as we know, has not yet been recorded. A patient with a compound fracture of the thigh suddenly died during anesthesia from chloroform. The chloroform was pure; no food or mucus was found in the mouth; the tongue had been drawn well forward, and on the first appearance of serious symptoms, when but little of the anesthetic had been given, artificial respiration and electricity had been used, but in spite of all, and from no known cause, the patient died.

The autopsy explained it all. A piece of chewing-tobacco was found in the larynx, completely obstructing the glottis. Hereafter not only must the operator remove artificial teeth before giving an anesthetic, but he must see that a tobacco-chewer has none of the beloved weed hidden in any remote corner of his mouth. At the University Hospital, in Philadelphia, we learn, this precaution is always taken, since in one case lately a patient nearly died from this cause.—*Medical News.*

A Caution in the Administration of Nitrous Oxide.—Mr. Alfred Coleman related a case illustrating the danger of the not uncommon practice among dental practitioners of giving an anesthetic and operating single-handed. Nitrous oxide was administered to a little girl for the purpose of removing two molar teeth. Just as he had extracted one of them the gag slipped, and while he was engaged in opening the child's mouth and attempting to grasp the second

tooth the gentleman who was giving the anesthetic called out that the patient was not breathing. Artificial respiration was at once resorted to, and she soon came round; but at the critical moment he was himself too much occupied to notice the sudden stoppage of respiration, and he felt that, had he been operating without assistance, he should almost certainly have lost his patient.—*Proceedings Odontological Society of Great Britain.*

TREATMENT OF TONGUE-TIE.—Various and elaborate instruments have been adapted by different surgeons for the treatment of tongue-tie (as it is commonly called by the profession at large) by incision. I think the following method preferable and much safer. I pass my right index-finger into the mouth of the infant to be operated on, under the tongue, and press my nail against the frænum till I rupture it to a sufficient extent. So far my cases have turned out quite a success. The plan, I am sure, will recommend itself to all.—*J. Brindley James, in British Med. Journal.*

HINTS AND QUERIES.

"He that questioneth much shall learn much."—BACON.

CORRESPONDENTS desiring a reply in this department are requested to make use of *distinctive signatures or initials*, and avoid the practice of signing their communications Reader, Subscriber, etc.

CORRESPONDENTS who wish notice to be taken of their communications should authenticate them with their names. We cannot insert queries or replies except they are so accompanied. Names not necessarily for publication.

IN Dr. Coffin's article on regulating teeth by the "expansive plate" system, I read, "The general form may be described as a rather thin vulcanite plate, capping and clasping some or all of the bicuspids and molars," etc. Now, I want to know if, in the use of this plate, the "capping" (by which I judge he means the building of a guard of the rubber covering the crowns of the teeth, and keeping the teeth from occluding with their antagonists) assists so materially in the moving of the teeth. In general, I have succeeded in moving them without breaking the occlusion; but I want to know if, on the testimony of those qualified to give an intelligent opinion, it is desirable.—J. H. MARTINDALE.

I HAVE often read of dentists building up crowns that have been abraded and become sensitive. How is it done? A screw would not answer, I should think; yet it would be impossible to cut down for a base and retaining-points into the sensitive surface (unless the pulp had been destroyed) if the abrasion has been too rapid to allow the pulp to protect itself. Occlusion, it appears to me, would also be impossible unless all antagonizing teeth were similarly treated.—C. G. S.

LET me tell Dr. Guiwits ("Hints and Queries" for May, 1882, p. 277) how to get a model that will not break, chip, or warp, and that can be easily separated from the plate without danger of springing the case or cracking the gums of block-teeth. Prepare a perfect model; make it smooth with French chalk and dust it lightly with the same to prevent the molding-sand from adhering to the model; get a perfect mold, being very careful not to rock the model in removing it from the sand; use pure block-tin, pouring as hot as possible without causing bubbling; wait eight or ten seconds, and pour out all the metal not set from

before backward, to insure the thinnest part of the cast being in front. Now cut down in several places, from the edge of the cast to the center of the alveolar ridge, with a very fine frame-saw, and fill the model with plaster. By repeated trials you can get a tin model so thin that, unsupported by plaster, it can be crushed with the thumb and finger, but which when filled will stand any strain put upon it. To remove the case, with a strong pair of pliers pull the parts of the cast between the cuts toward the center, and the case will drop off. It takes a good many trials to get a smooth, thin tin cast, but it allows the keeping of the plaster model and insures a smooth, polished surface next the tin, needing only chalk and brush wheel to finish. The time taken in getting such a model is really less than that consumed by removing pimples and scouring and finishing up the palatal surface of a plate vulcanized on plaster,—all of which must necessarily interfere with the exact fit of the plate.—Charles J. Rathbun, D.D.S.

Answer to W. G., in "Hints and Queries" for September: Take out the amalgam, and see that the tooth is in a healthy condition; fill with a non-conducting substance—some one of the cements; let it remain for a time, say two or three weeks, and then remove just enough of it to cap with a more durable material.—W. V. Rice.

In answer to R. V. W., in "Hints and Queries" for September, I will not undertake to tell the cause of "teeth-grinding" during sleep, but to correct it and save the teeth I make a rubber plate (generally using black rubber) to go over the crowns of the molars and bicuspids of the upper jaw, to be worn while in bed.—J. N. Davenport.

If "Bayonne" will examine the case in question, he will probably find one or both his plates impinging on the salivary glands (presumably the lower at the sublingual), and by its constant irritation causing the flow. A plate should always be clear of the glands, and, with rare exceptions, of the muscles also. If the muscles are allowed to bear on the plate, they tend to throw it off the jaw, and under it instead.—A. F. U. U.

I think Edward Hale will find that tin foil rolled into a small rope will answer the purpose, instead of gold, in absorbing the excess of mercury from amalgam fillings; use by lightly tamping the filling with the end of the rope.—F. H. Brown.

Criticising Criticisms.—In the same fraternal spirit that Brother W. E. Driscoll criticised my criticisms in the September number of the Dental Cosmos, allow me to reply, in part by way of explanation, and in part by retort.

1st. Referring to my condemnation of the practice of devitalizing pulps, he says, "If he had added 'such as can be saved,' he would have been invulnerable in his position." Let me say that, had all dentists microscopical eyes, and were all exposed pulps accessibly situated for their scrutiny, and did all practitioners thoroughly understand the various pathological conditions of both patient and pulp, then there might be some excuse in certain cases for the use of arsenious acid or the extirpating broach. But, with Dr. Wm. H. Atkinson and many others, I long ago banished arsenious acid from my dental materia medica, and have found that, with the proper conservative treatment, those pulps which *cannot be saved* are by that same treatment wafted to their demise "on downy beds of ease."

No writer, laying down a general rule of practice, can always stop to mention the exceptions to that rule which might arise in practice. Only a few days since

I had occasion to extirpate a living healthy pulp, where by accident the crown of a cuspid tooth had been broken off, and it was necessary to save the root for the attachment of an artificial crown; and there might be cases of pulp-exposure from caries, where the pathological symptoms were most unfavorable, and the patient living or about to go beyond the care of a dentist, when extirpation would be justifiable, that the tooth might be filled and the case dismissed. But, as a rule, I believe the conservative treatment to be the proper one; for in some cases, where suppuration had set in and every symptom was most unfavorable, I have restored pulps to a healthy condition, capped them, and filled the teeth, and they are to-day living members doing good service. In looking over my register I find one such case of over five years' standing, another of about three, and others of shorter periods. Therefore, I reiterate that *the proper treatment of exposed living pulps is the conservative one.*

As to the soft-foil-lining criticism, I admit that in many cases it is not practical, yet in many others it is; therefore, it is not all "naked theory." I do not claim that perfect fillings cannot be made without it.

As to No. 60 gold foil being suitable "for all kinds of fillings"—or more suitable than Nos. 2 to 4, I certainly should have to "see it used by one who really understands how to manage it" before being converted to that theory. I had regarded the heavy-foil "craze" as an epidemic of the past. But if Brother Driscoll and his Indiana colleagues have a quality of heavy foil which I have not seen, and a method of using it which I do not understand, then they have my congratulations. I have used the heavy foils of various preparations, and still use Nos. 40 and 60 in contour work; but not within the cavity-walls. I know that moisture-tight fillings can be made with these foils, but the point I tried to make in my former communication, and the one I shall try to make now, is that it is easier to make such fillings with the lighter foils,—easier to the operator because of its readier adaptation to the walls of the cavity, and easier to the patient, because of the very much less mechanical force necessary to condense it.

Finally, I agree with Dr. Driscoll that these criticisms may do much to get some of us out of the rut of error, where we can see things in the light of science and reason. The dental profession has had many a mania, and has some still, which it needs to be cured of. To-wit, there was the rubber-base-plate-mercurial-poison mania, and I think there are some lingering cases of it yet there was the wide-V-shape-separation mania, which, I am happy to say, was not very contagious; there was the sixth-year-molar-extracting mania, which is all right in certain cases, but is an exception rather than a rule. Then there was the "nothing but gold" filling-material mania, and the mercurial-poison-from-amalgam-fillings mania,—the last two of which have been pretty successfully treated by Prof. J. Foster Flagg. I would that we had more iconoclasts like him.—Rex, *Lincoln*, *Neb.*

Cohesive and Soft Gold.—A well-written article by A. A. Blount, D.D.S., of Geneva, Switzerland, upon "The Merits of Soft and Cohesive Gold as Filling-Material," appeared some time since in the *American Journal of Dental Science.* I desire in a friendly way to take issue with the writer upon his manner of inserting a gold filling, and to condemn the practice of using soft and cohesive gold in the same cavity in the way he suggests. The preparation of any given cavity, whether simple or compound, we will not discuss, assuming it to be done in a thorough manner. As to the introduction of the gold, Dr. Blount says, "We will suppose our cavity to be an approximal one in a molar or bicuspid; we will

commence the operation by lining the cavity, beginning at the cervical wall, where we have already prepared it in such a manner as to retain the foundation or starting-piece of our filling. Let us begin with *soft foil* on the lateral walls until we have reached the grinding-surface, all the while allowing the gold to extend beyond the border, as in the beginning." So far I believe the operation good, and if the doctor had but continued with his soft gold until the cavity was filled the work to some operators would no doubt have been satisfactory. But instead of using soft gold for the operation throughout, he simply builds about the walls with it and then as follows, according to the statement further on in his article: "Now let us begin again at the cervical wall as before, only this time with cohesive foil and smooth, oval-pointed instruments, placing over the soft a layer of cohesive foil of sufficient thickness to ins re perfect solidity. After having thoroughly covered the soft with the cohesive foil, finish the borders," etc.

As to the finishing, no objections can be offered. But is it not strange that one of so much experience as Dr. Blount should advocate the idea of using soft and cohesive foil in the same cavity for the purpose of making a more perfect operation than could be accomplished by the exclusive use of cohesive foil?

I do not wish to be understood as denying that some teeth can be saved by following the directions of Dr. Blount, but I hold that filling a *compound cavity* in a bicuspid or molar in accordance with his directions is a decided error, and that such teaching is well calculated to work mischief with those just entering the profession. I should dislike very much to have a patient with a tooth thus filled leave my office with the understanding that the operation was to be permanent, and should expect to hear sooner or later of a failure. Of course, there is no union between the soft and cohesive foil, and this fact, together with the knowledge that every available undercut or furrow has been filled with soft foil, is sufficient to enable any one to see that failure is inevitable.

Such a filling is nothing more nor less than one made after the old-fashioned wedge-work system, with a ball of cohesive foil in its center, which may become detached at any time by the act of masticating. If the main part of the filling becomes loosened from any cause, what does the soft foil amount to, so far as preserving the tooth is concerned? Such practice is not based upon scientific principles, and will be condemned by those skilled in the manipulation of cohesive foil. Successful operations have been made and are being made to-day, not only in teeth of first-class bone-structure, but in those below the average, by the use of strictly cohesive foil. Operations from the hands of such men as Drs. Corydon Palmer, William Taft, and others that I might mention, with cohesive foil, have stood the test for years, and the fillings are in a fine state of preservation at this time. Many of these operations were extremely difficult, and upon teeth where some would consider time and material wasted. Soft and cohesive foil may be used in the same cavity, but certainly not in such cases as are mentioned by Dr. Blount, and in the manner he describes. Tin and cohesive foil may also be used in the same cavity, but if success is to be expected and any degree of permanency insured we should not rely upon building about the walls, filling up the retaining trenches with tin foil, and then finish the operation with cohesive foil. In *simple* cavities such work will answer, but certainly not where there are any complications.

There is no question but that many failures occur in teeth filled with cohesive foil, but this is the result of defective work, and therefore the gold and the so-called incompatibility should not be held accountable. If the cavity is properly prepared and the gold thoroughly introduced with the electro-magnetic mallet

and *finely serrated* (never smooth) and properly formed points, the result will be beautiful and entirely satisfactory to both patient and operator. Smooth points will answer very well for finishing a filling, but should never be used in impacting the gold. In compound fillings the use of soft foil is, to my mind, entirely out of the question. Commence the operation, whatever it may be, by using strictly pure cohesive foil, and continue with it until the end is reached. I would ask Dr. Blount if he would advocate restoring living teeth, that have been worn away either by mechanical force or chemical action, to their original contour by building with gold, and, if so, would he advise the same course as he recommends in filling approximal cavities in the bicuspids or molars? Certainly the same agents that produce destruction in the one case would accomplish it in the other. Would it be possible for him to begin his operation with soft foil, fill the retaining-pits, "allowing the gold to extend over or beyond the border," and then, in order to have a surface that will resist the action of mastication, finish the building process with cohesive foil?—J. Clark Scott, D.D.S., *Lancaster*, *Ohio*.

Plain-Plate Teeth for Pivoting vs. the Bonwill Crown.—With a feeling of disappointment I abandon the reliance I placed in the Bonwill crown; for, in common with the profession in general, as I heard it voiced in journals, etc., I enthusiastically hailed the advent of these pivot-teeth, indorsing all that was said for them as the pivot-tooth of the future. Therefore, it was while I was prejudiced in their favor, not against them, that I had forced upon me the logic of facts which I now submit.

The chief objection to the Bonwill crown is that its hold upon the pivot-pin is very insecure; being retained merely by amalgam, it is not nearly so strongly fastened as is the plain-plate tooth, to the pins of which the pivot is soldered. It is therefore liable to come loose, even at its best; but so easily may the crown be displaced while the amalgam is setting that this liability to loosen may be reckoned as two-fold. Of course, the pivot-pin may be soldered in the Bonwill crown, and thus made secure, but this plan presents two objections: First, the amalgam cannot then be condensed by a plugger around the pivot-pin in the root, as can be done when plain teeth are used; and, second, there is a liability of there being such an excess of amalgam between the root and crown that it cannot be sufficiently pressed out in driving the crown home so that a dark line will not remain at the labial joint.

The plate-tooth, having but the labial edge to be fitted to the root, may be ground to shape in much less time than the Bonwill crown. In the use of the latter it is difficult to fit it to the root so exactly that lodgment of food, etc., is avoided, while nothing is easier than to contour the amalgam backing of the plain-plate tooth to the precise outline of the root. Any manipulation of the amalgam about a Bonwill crown, after it has been driven home, is liable to displace it before the amalgam has hardened.

In those "bites" where the lower incisors articulate with the incipient cusps of the superior incisors, almost level with the gum, it is no easy matter to arrange a Bonwill crown so that the lower tooth will not occlude with it at this point to the prevention of the occlusion of the other teeth. In the attempt to remedy this by grinding away the crown at this part, there is danger of its being made so frail as to fracture during mastication.

The greater variety of shades and sizes of plate-teeth may also be mentioned as inviting to their use.—Stewart J. Spence, *San Francisco*.

In the Dental Cosmos for August last Dr. Bonwill gave an elaborate de-

scription of his amalgam, and how to mix it, and at page 424 he states, "The treatment of gold with mercury is, I believe, new." I beg respectfully to inform him, through the medium of your journal, that it is not new, as the following formula published in the *Pharmaceutical Journal* for March, 1850, vol. ix., p. 404, will show:

"*An Amalgam for Stopping Teeth.*—Chloride of silver is prepared by precipitation from the nitrate by adding common salt. A pasty deposit immediately takes place, and when all the silver is thrown down (which is known by the addition of a few drops of hydrochloric acid not rendering the fluid turbid) it should be washed and drained, so as to leave a pasty mass. Into this a piece of zinc is immersed. In the course of two or three days (according to the quantity submitted) all the silver will be reduced to the metallic state; you then remove the zinc. To ascertain the weight of silver you have to amalgamate, it is necessary to weigh the piece of zinc before submitting it to the paste, and the loss of weight which the zinc sustains will be equivalent to the weight of metallic silver produced. To this may be added six or eight times its weight of mercury, which must be triturated in a mortar with warm water for several hours, or so long as the mass continues in the least to discolor the water. The operator will discover the pasty adhesiveness which the amalgam will acquire as he proceeds; and for this part of the process it is better to have an excess of mercury, which can be squeezed out, and should leave, at the conclusion of the operation, an amalgam composed of one part of silver and four parts of mercury. This amalgam of silver is to be united with an amalgam of gold. The amalgam of gold may be prepared by putting ribbons of pure gold (similar in thickness to that which gold-beaters commence beating with) into heated or nearly boiling pure mercury, and in the proportion of four mercury to one gold. This may be poured into a mortar containing water, and washed, as the silver amalgam, so long as the lead discoloration appears in the water. This should be freed of its superfluous mercury, and the mass should consist of gold one part, mercury three parts. The amalgams being now perfectly pure, it may be well to keep in separate boxes the little pallets necessary for combination of the compounds, and the proportions are two parts by weight of the gold amalgam to one of the silver. It is found to become a more compact mass by the first crystallization, although, should there be any residue, it may be heated, rubbed up again with a fresh supply for a future operation. The two pallets had better be triturated thoroughly in a mortar before the compound is submitted to the flame of a spirit-lamp, and for the better incorporation it is necessary to submit it to heating and trituration in the usual way three or four times."

Therefore, the addition of gold to mercury for amalgams was known to the dental profession thirty-two years ago.—E. Gregory, M.D., D.D.S., L.D.S.

I lately saw approximal fillings of Flagg's enamel that were inserted four years ago, and were still as good as at the first day. I also saw yesterday a large plug in a frail and broken central incisor just the same as it was left by me five years ago, and my "case book" says it is "Johnston's gutta-percha." I, two weeks since, saw twenty-eight plugs of "stannous gold" in perfect condition inserted by me eight years ago; many of the teeth were mere shells, the teeth of a mother and two daughters.—Henry S. Chase.

To make a stiff, double-faced paper disk, fold a sheet of sand-paper back to back, stick together with mucilage, dry under pressure, and punch to suit. Pieces of the same work well in finishing rubber plates.—F. H. Brown.

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ORIGINAL COMMUNICATIONS.

THE ORIGIN AND PHYSIOLOGY OF NERVOUS FORCE.

BY W. C. BARRETT, M.D., D.D.S., BUFFALO.

[Read before the American Dental Association, August 3, 1882.]

There are two things of which I wish to speak, and these two things make up the sum of the whole universe so far as man can know. They are matter and force. I say the study of these must form the whole, the entirety of human research, so far as any positive knowledge, or the hope of definite information is concerned. We may speculate and theorize and dogmatize upon things spiritual and metaphysical as much as we like, but concerning them we can by no possibility arrive at any definite conclusion, nor can we *prove* any assertion, it matters little how wild it may be, as either absolutely true or false. When we come into the domain of physics we are studying the actual, the real, the tangible.

I desire, then, for a few moments to consider in a general way matter and force: the one real, positive, palpable, inert; the other immaterial, ethereal, incorporeal, yet dominative over the tactile mass—a law which is ever active in bringing about definitive changes in the passive matter; a ghostly, pervading something, which changes a dead, a lifeless, an inanimate mass of chaos into this world of life and joy and beauty and animation.

What is this mysterious influence that we call force? Let us examine it. But in what I have to say I desire it ever to be borne in mind that I am speaking solely of physics, and that it has no kind of metaphysical or speculative application whatever. The relations of mind to matter it is no part of my present plan to endeavor to trace out.

Force can be studied only through its chief resulting phenomenon—motion. We find that matter and force are infinitely opposed.

Matter seeks eternal rest; force perpetual motion. They mutually react upon each other, matter being by force constantly changed in its characteristics; force by matter continually varied in mode of manifestation. They are thus mutually interdependent, co-existent, eternal parts of one stupendous whole; interdependent because one cannot form a portion of this universe without the other, co-existent because each pervades the other, and eternal because both can die only together. It has long been an axiom in physics that matter is imperishable. The same train of reasoning which proves this establishes also the fact that force is indestructible. If an atom can change its condition only through the exertion of force, if its form only can be altered, the bonds which unite it to certain other atoms only be liberated to enable it to form new unions with yet other atoms, and yet if not one of those particles can be lost or annihilated, then can force, only by the reaction of matter, be induced to change its mode of manifestation or its direction. If not an atom has ever been destroyed since matter existed, then it necessarily follows that not an influence, not a wave of force has ever been extinguished since, simultaneously with matter, it first exerted sway. We may, through the action of force, alter the condition of matter; we may, through the reaction of matter, change the character of force; but both are alike indestructible and eternal. Matter is all one under whatsoever form it may exist. Force is a unit however it may manifest itself. These are predicates, truisms, self-evident, self-proved, fixed laws of physical science. This doctrine is not new, for as long ago as 1845 Faraday declared that he held the opinion that the various forms under which the forces of matter are made manifest have one common origin, and are so mutually interdependent that they are convertible one into another, and possess equivalents of power in their action. To my apprehension, matter and force are as intimately connected as are what Faraday calls the different manifestations of force with each other. We cannot conceive of matter except as it be subject to force. We cannot imagine power as distinct from the matter upon which it acts. They are essentially co-existent, coeval, synchronous.

Force may act upon matter in different ways, and the result may be motion of a mass, or of atoms. The changes consequent upon this action may be those of external form—morphological, or of internal structure—molecular. According to the peculiar manifestation of it we have been accustomed to call it heat, light, electricity, or chemical affinity; but in whatever mode it becomes sensible to our perceptions there is one definition which will always describe it, one expression which always characterizes it: it is essentially matter in motion. Heat was formerly regarded as a subtle

substance, with unknown, tangible qualities, and its specific name was *caloric*. It was, with light and electricity, classed as an imponderable fluid, because it was conceived that no other hypothesis would account for the phenomena which they exhibited. Light, it was supposed, consisted of minute characteristic particles, which proceeded from the sun, or from any luminous body. Electricity, also, was regarded as an invisible entity of some kind, possessed of peculiar qualities. It was known rather by its physical manifestations than from any knowledge of its character, but the general opinion held it to be an extremely tenuous matter, which, while pervading most substances, could yet be bottled up, confined, or dissipated at will. It was usually spoken of as the electric *fluid*, and in my early school days I was taught that there were two kinds of electricity—a positive and a negative—which were always seeking to neutralize each other. Further study and investigation made manifest the absurdities of those crude theories, and a new hypothesis was invented—that all these supposed entities, these actual, positive existences of some kind of matter called light, heat, etc., really acted through a specific medium, a fluid which pervaded all matter and all space, an invisible, intangible ether, which, once put in motion by the action of light, heat or electricity, had sufficient power to produce all the violent phenomena which were supposed to be the effects of these agents, and this hypothesis is held by many people to-day. Count Rumford disposed of the material theory by immersing two iron or steel bodies in cold water, and then by the friction or attrition of the one upon the other gradually raising the water to the boiling point. This was the initial attempt at removing the consideration of the study of force from the domain of metaphysics to that of physics.

Prof. Grove first publicly announced the modern theory that the so-called imponderables, light, heat, electricity, etc., are peculiar states of ordinary matter; that they are resolvable into motion, that they are in fact all very closely connected, and the new doctrine was denominated the Correlation of Physical Forces. The doctrine was taken up by others, the real nature of the so-called forces was studied, and the further proposition was enunciated that they are all mutually convertible into one another. It was necessary in the consideration of these forces to study them in their manifestations, to compare them with other physical phenomena, and note their resemblances or their discrepancies. It has been determined that most, if not all the forces, progress by means of an undulatory or wave-like motion, not unlike the advance of the concentric waves made by casting a stone into a smooth body of water. This hypothesis is firmly established as regards sound, not

only by actual measurement of the vibrations of resonant bodies, but by the very structure of our own auditory apparatus.

The vibrations produced by light have not only been demonstrated, but accurately measured. And not only this, but it is very clearly shown that the different colors of the solar spectrum are produced by a definite number of vibrations upon the retina of the eye. Further, the very number of these wave-like beatings have been ascertained and counted. The most delicate, but at the same time the most determining experiments have been conducted, and these demonstrate that to produce the color at one end of the solar spectrum, red, 480,000,000,000,000 of these vibrations must impinge upon the retina in each second; while to produce violet, the color at the other extreme of the spectrum, the number of vibrations per second is no less than 720,000,000,000,000.

The same arguments which are applicable to the undulatory theory of the progress of light are equally pertinent in the consideration of electricity, for its mode of progression has been shown to be nearly allied to that of light.

And now let us for a moment consider the characteristics of some of these forces. Sir Humphry Davy says that the immediate cause of the phenomena of heat is motion, and the laws of its communication are precisely the same as the laws of the communication of motion. We know that all molecular motion is accompanied by the evolution of heat to a greater or less degree. This is equally true whether it be of the changes incited by what is known as chemical action, or the motion induced within the mass of iron upon the blacksmith's anvil. We also know that the same molecular disturbance generates what is known as electricity, and that both these elements are operative in inducing that change sometimes called chemism. It is equally true that each of these forces is convertible into any of the others. Thus, if we commence with chemical action, we all know how, within the cells of the battery, this action is made manifest in the electrical current, and thus chemical force is converted into electrical force. If now this force be generated in sufficient quantities and conducted along a wire of sufficient size for its easy transportation, and if in this "circuit" a piece of small platinum wire of such size as to partially obstruct the "current" be inserted, we all know that the platinum wire soon becomes red-hot, and we see an instance of the conversion of electrical force into heat. The galvano-cautery is an illustration of this. If now the current be increased, and the obstruction be entire at one point, the most dazzling radiance is manifest, and here we have an example of the conversion of electricity into light. The electric light is an illustration of this.

Here, then, commencing with that simple molecular disturbance

within the battery, we see the force generated by those movements manifested first as chemical action; this is converted into electricity, the electricity into heat, and the heat into light, and all without the addition to or the substraction from the original force, as first made manifest, of anything whatever. This proves conclusively that whatever name we may give the phenomena exhibited, they are all due to the same cause, have the same origin, are convertible the one into the other, are in fact all the same thing, differing only in the mode of their manifestation and the accompanying phenomena.

The sun is the great source of light and heat for this earth. The so-called rays of the sun may be made manifest to us in many different ways. If, for instance, we take our stand with that body exposed directly overhead, its influence is chiefly exhibited to us through that which we call heat. But we may interpose between us and the sun crystals of alum, and these will intercept those undulations which are known to us as heat, or in other words, it will so change the character of these vibrations that the sun's influence is no longer manifest to us as heat, but the heat-rays have become light-beams. In other words, the heat is converted into light. Again, we may interpose another substance, and there is neither heat nor light in the sun's influence, but its rays now induce those molecular changes which we know as chemical action. Thus the same rays of the sun may be changed and made manifest to us as light, heat, chemism, or electricity.

Force, then, is but a mode of motion, and according to the manner in which it is manifest to our senses we call it by the names which I have considered. But force may remain latent for an indefinite time. In my school-boy days, when we considered heat or caloric, we called it either sensible or latent. Further study will teach us that such terms are the result of our lack of understanding of the subject. There may, in one sense, be such a thing as latent force, but heat is only a method of the manifestation of force. The sun is, as I have said, the origin of all force, because within its body certain changes were originally organized and put in motion, whether by Omnipotent power, as our system of theology teaches, or by inherent qualities, as materialists claim, it matters not in this connection. These molecular changes are the origin of the unit force. The effects of these changes are eternal, imperishable, indestructible. But they are not necessarily incessant. They may be stored up, imprisoned, only to be liberated through the transference of some other influence. As thus: In the early carboniferous ages the force liberated through the changes going on within the sphere of the sun being manifested upon the earth as light, heat, and chemism, induced certain molecular changes here, which resulted in the new combina-

tion of the elements of matter then existent, and the consequence was an extraordinary organic growth, and the formation of the carboniferous forests. The continued force, which had its initial point in the sun, still active, but modified by previous changes of the same matter, and by self-limiting, environing circumstances, finally resulted in those immense carbon deposits which to-day form our coal-fields. The coal which burns in my grate is but the imprisoned force which was originally derived from the sun, and which came in the form of light, heat, electrical and chemical changes. For proofs of this we have but to subject it to favorable influences, and there will be returned to nature the same identical light, heat, chemical, and electrical forces which so long lay inactive, dormant, latent, imprisoned within the coal-bed. It is capable of demonstration that the amount returned is the exact amount so long ago received from the sun. But the light, heat, etc., or in other words, the force liberated in my grate is not lost or wasted; but is absorbed, appropriated, perhaps imprisoned within other masses of matter, to be in turn again yielded up and again utilized. Or perhaps the force so eliminated from the coal is at once made manifest in some other mode of motion, and thus transmitted on and on, now exhibited as heat, now as electricity, and again as light or chemical affinities.

I might enumerate very many instances wherein one manifestation of the unit force is changed into another. I might speak of the heat, the light, and the electricity which in various ways accompany or are the result of all chemical action.

I might show that electricity, and light, and chemical action are ever attendant upon the development of heat, and that heat and light and electricity are the accompaniments of the development of chemical action; but it is all summed up in the declaration that all movements of matter, in whatsoever way they may be brought about, are producers of the unit force in some one or more of the methods of its manifestation. I cannot open or shut my jack-knife without the evolution of heat and electricity in greater or less degree. If I bring the blade of my knife in quick, sharp contact with another substance sufficiently hard and brittle, heat and light are made evident to the senses, as in the use of the flint and steel.

The evolution of force and its methods of manifestation are controlled by definite laws, which are as yet in a great degree unknown to us. Prof. Grove says that the law or rule as to the production of heat or electricity from friction or percussion is that when the mutually impinging bodies are homogeneous, heat is the consequence; but when they are heterogenous, electricity is evolved, although either is in a greater or less degree the constant accompaniment of the evolution of the other. In fact, it is true that the

production of one force or mode of motion is, as a rule, accompanied by more or less of the others. The beautiful photographic process, which is but the conversion of light into the molecular motion commonly known as chemical action, is accompanied by the evolution of heat and electricity, though in quantity not appreciable to anything but the most delicate apparatus. If I bend a poker across a chair-back the molecular disturbance of the iron, if it be measured by thermometers and electrometers of sufficient delicacy, will distinctly show an alteration in temperature and electrical condition, and this is true of every change in the relation of the atoms which go to make up matter.

Matter is composed mainly of four simple elements—oxygen, hydrogen, nitrogen, and carbon. Of these four three are gaseous, and their atoms move freely and with little friction. Many of the compounds of these elements are what are called allotropic, or isomeric—that is, two bodies are composed of exactly the same number of atoms of each element, and yet they are totally unlike because the *relation* of the atoms is not the same. Thus the oils of turpentine, lemon, and juniper are chemically the same, yet physically different. So that it is seen that very slight atomic or molecular changes produce wide divergences in the character of compounds. Then, too, there is abundant opportunity for such changes to be brought about by a very slight exertion of force. The compounds of nitrogen (and this includes all the so-called albuminoids) are very mutable, and are ever seeking for some more permanent union. The exhibition of the slightest force is sufficient to induce a disruption of imprisoned chemical affinities, which may result in wide changes.

Again, compounded matter exists in a number of forms, as gaseous, liquid, and solid. Of these the first two are easily impressed, and molecular changes are constantly going on. Solid matter exists in two different states—the colloid and the crystalloid. Of these the first is unstable and exceedingly mutable. So that of all the forms in which matter exists, there is but one in which it is not easily changed and made to assume new molecular conditions. We have shown that every such molecular disturbance, however induced, is followed by the evolution or the transference of some one or more of the various manifestations of force. Given, then, that most forms of matter readily undergo molecular and other changes, and that the manifestations of existent force, such as light, heat, chemism, etc., are constantly active, and that such action can only result in still another transference of force, it may readily be seen how unceasing must be the phenomena presented by all these mutations and mutually-induced changes. Every wave of force exerted at the initial period of this universe has been since that

time and ever will be existent, and either constantly, actively exerted, or passively imprisoned by superior force. Matter is, under the action of force, constantly being disintegrated and its constituent particles built anew into fresh forms. And so this tearing down and redistribution of matter is, under the dominion of force, constantly going on. Every organized being, whether animal or vegetable, has its period of molecular aggregation, of growth and so-called nutrition, of active, progressive changes, and then the same forces which have resulted in the combination of the molecules which make up its substance, are again active in these yet further molecular changes which bring about its morphological destruction. I say the same forces which brought together the molecules which compose this body of mine, will in time insure their separation, and thus bring about the disintegration of solid and fluid tissues, and return them again to the common stock of matter, while the energies which brought about these definitive changes, through the reaction of the matter thus metamorphosed, will in turn be transformed into other forces, and itself returned again to the parent or unit force whence it was segregated, and thus will all that which goes to make up this Ego, this individual I, be returned again to that great source from which it emanated.

If this doctrine of the unity and the correlation of forces be admitted as true in its application to the various forces of which we have been speaking, are we not justified in assuming that the law is general throughout the material universe? And whether we study this unity as exhibited in the macro-cosmos, or in the micro-cosmos—in the revolutions of solar systems, or in that affinity which binds together two atoms; in those early convulsions which resulted in the upheaval of continents, or in the change which culminates in the growth of a blade of grass; in the devastating earthquake, or in the fall of a leaf in autumn; in the whirling in infinite space of a planet, or in the infinitesimal vibrations of a ray of light; in the action of volcanic fires, or in the molecular changes within the single battery-cell,—we shall see that in any extreme it unfailingly exhibits the same characteristics. It is the exhibition of the same force which results in the molecular aggregation called man, and in that of the lowest organic life. Within the two organizations constant molecular changes are going on that differ but in degree. The results of those changes in the two are precisely alike in fact. Life—vitality—in the one is, in a physical sense, precisely what it is in the other, except that in the lower it is simple and all the processes are elementary; in the higher it is complex, and not readily comprehended.

And now, having considered the law of the correlation of forces

in its application to the lower forms of matter, shall we stop when we are just upon the threshold of the secret places of nature? We have shown that in inorganic life the law prevails and explains all the phenomena there exhibited; shall we admit that the harmonies of nature become discords when they are played upon the strings of a more perfect instrument? As we rise in the scale of existence shall we conclude that, where before all was beauty and harmony and exactness, now all becomes discord and falsehood and incongruity? Shall we admit that the laws which are universal in the lower objects are suspended when we arrive at the point where they are most needed to make things congruous? The world has long accepted as a fact the belief that man is a law unto himself, and that his physical being is not subject to the rules which govern all the rest of creation. The life of one of the lower animals was thought to be one thing, that of man to partake of a very different essence; that the vitality of the shrub which grows by the wayside had no kind of resemblance to the flower which blooms in our gardens. Let us look into this thing.

My subject, as announced, is Nervous Force. Perhaps many of you have wondered if I were to pay it the respect of a passing glance, and if so what my long prelude meant. It was necessary that I first establish and make clear to your comprehension the doctrine of the correlation of forces before I attempted to apply it to other and higher uses.

We have seen that the light and heat of the sun, under favoring conditions, have developed or been transformed into other forces. We have examined those forces, and have found them a unit in their origin, though diverse in their mode of manifestation. We have seen that light may be changed into heat, heat into electricity, and that into chemical affinity; that all these so-called forces are mutually interchangeable, alike, identical; that each is the result of certain molecular changes, themselves induced by manifestations of other varieties of the unit force. We know that all organic bodies, whether of low or high degree, are composed of the same atoms that unite to form other matter, and therefore they must be amenable to the same laws.

There are certain phenomena connected with living matter called vital phenomena. Under the old hypothesis—that there were many kinds of force, and that each was an entity, acting in an independent manner upon such matter as was subject to its influence—it was easy to suppose that nervous force was a something distinct and by itself, and that it was not subject to the laws which governed other forces. When it was believed that magnetic attraction was a pervading something which established a kind of affection between

certain substances, and aversion toward others, and that this attraction was a thing by itself, dominated only by its own laws, and owing no allegiance to the ordinances which governed the relations of other matter, then it was easy to imagine that nervous force was a principle alike distinct, separate, and removed from all other dominant forces. In that early day there was no harmony in nature, but a continual clashing and discord among mutually contending forces. Let us now suppose that nervous impulse is but another mode of manifestation of the unit parent force, and how quickly all becomes harmony and beauty.

The lapse of time admonishes me that I cannot pursue this inquiry with all the minuteness with which I endeavored to examine the physical forces; but that *all* force is identical, interchangeable and the same, seems to me plain for a number of reasons. In the first place it is derived from the same source. The same molecular changes and mutations which in the battery-cell result in the evolution, or more strictly speaking, the segregation, of electrical force, is here manifest as nervous force. We are constantly supplying the elements of this nervous battery in the food which we take, and those molecular changes which we denominate digestion and assimilation result, as such changes ever do and must result, in the elimination of a force which, in this method of manifestation, we call nervous force.

If an animal be deprived of every kind of food except fats, it finally dies of inanition, though there is no apparent emaciation. The changes incident and necessary to nutrition cannot be carried on in the absence of necessary elements. The molecular changes of the digestive process having partially ceased, there is a consequent diminution in the evolution of nervous force, which finally results in complete functional stasis, or death.

Again, that nervous force is identical with the other forces is manifest from the fact that in many of its phenomena it is the same. As light and heat are modified by other forces as well as by the circumstances under which they are made manifest, so nervous force is dominated by the environments which surround its elimination and exhibition. The methods in which the changes which result in light and heat progress, the elements taking part in such changes, all have an influence upon the characteristics of the force so generated. This is also true of nervous force. When the molecular changes going on within the body in which is generated nervous force are most active, the force generated is greatest. When these changes cease, nervous force is no longer generated and the body is dead. When the products of these changes are for any reason transformed into heat, as in certain pathological conditions like fevers and inflammations, nervous force is decreased. If the body be sub-

jected to intense cold, the transformation of these changes into force is retarded, and not only is the temperature of the body reduced, but nervous force is diminished, and the organs which are controlled and regulated by it become torpid. Certain drugs have the power entirely to suspend these transferences of force, or to modify them greatly. So in the generation of other forces through the chemical or other changes which induce them, the elimination or action may be modified or suspended by the introduction of interfering matter.

Nervous force may be changed into other forces, and on the other hand, light, heat, and electricity may be transformed into nervous force. It is not sufficient that the tadpole be furnished with the necessary food and heat for its development into a frog. Unless light be given him he remains in his tadpole state. If heat be not applied to the freezing animal there will be no nervous force; and how familiar is every physician with the fact that when nervous force seems exhausted, the mere application of heat supplies the needed nervous impulse—how else than by a transference of the force? If I apply the poles of a powerful battery to the nerves of an animal in which the evolution of nervous force is quite suspended, all the effects of that force are manifested. The heart can be made to beat, and any special muscle to act as in life, for a limited time—how else than by the transference of this mode of manifestation of the unit force? Electricity seems more nearly correlated to nervous force than is any other mode of motion. Indeed, in some animals they seem interchangeable at will. Thus the gymnotus, or electrical eel, by the possession of a more than usually complicated nervous apparatus, can give electrical shocks of considerable power at volition.

The fire-flies and glow-worms are also provided with special organs by means of which they can emit light at will, as the gymnotus does electricity; that is, nervous force is transmuted into light. In all such animals when nervous force is exhausted, when they are tired out by continued irritation or excitement, this power to emit light or electricity is gone, and it only returns when the nervous impulse is again perfect.

. The laws which govern the manifestation of nerve-force are less understood than those dominating the other forces. The force itself seems like an algebraic expression to be raised to a higher power, but that it therefore differs from the others does not follow. When in the light of the theory of the correlation of forces it is intelligently studied, we may hope that its phenomena will be better understood, and its conservation become a wrought-out problem. We have learned how electricity may be stored up—imprisoned against a

time of need. Why should we not discover the same thing concerning its nearly related nervous force? When the battery ceases to work we know how, within certain limits, to remedy the defect. What hinders our learning the same thing of the nervous system? Many men have striven to gain this knowledge, but not, so far as I know, in the light of the latest revelations of science. Nervous force has been regarded, as electricity once was, as an entity, an entirety, as something distinct from other forces. It is time that men began its investigation from another stand-point.

In the first pages of this hastily-written paper I said that the progression of force is, so far as we now know, by undulations and onward, wave-like motions. This is demonstrated by experiment to be true of nervous force. Even the rate of this advance has been determinately measured, and found to be in the motor nerves about 110, and in the sensory nerves about 140 feet per second; so that we see in its mode of progression it obeys the law governing other forces.

Of the manner in which nerve-force is eliminated we know little, but that it is in some way through the nervous centers we are convinced. Experiment has proved this, and at the same time established the fact of its close correlation with the other forces. When the nerve-centers are destroyed or paralyzed, not only is the production of nerve-force stopped, but the body quickly cools. Upon sending a current of electricity along the course of the nerves, the bodily heat or temperature rises, so closely are these forces connected. If an organic body be deprived of light, not only is nervous force diminished, but the temperature is lowered.

We have all known persons whose hair during conditions of nervous excitement would stand on end, and from whom at such times could be drawn distinct electric shocks. I know a man who, by inducing a restless, agitated, nervous state, in favorable atmospheric conditions, can light a gas-jet by simply holding his finger-tips to the burner. These states are always succeeded by nervous depression, undoubtedly due to a loss of nervous power, through its transmutation into electrical force.

That nervous force is very closely correlated with electrical force is again proved by the fact that all persons of highly-wrought nervous organization suffer extremely during electrical disturbances. So-called magnetic storms induce a condition of great nervous exaltation in many people. Nervously anemic people derive strength from a gentle electric current, because of its conversion into nervous power. People who suffer from nervous irritability find an exacerbation in electricity. That is, when the lesion is of the nerve-centers, the generators of nerve-force, electricity is beneficial; when in

the conducting nerve-filaments, it is aggravative for obvious reasons.

There are many other points and arguments which I should be glad to present, but this paper is already too long and I must leave the consideration of the subject. I desired to say something concerning a kind of nervous ebb and flow in certain members of the vegetable kingdom—to speak of the stinging nettles and of certain jelly-fishes, which without a discoverable nervous system yet give distinct shocks through some occult means—to speak further of the inordinate waste of nervous force in certain states of excitement or passion—to say something about the anatomy of the nervous system, and to examine a little the phenomena of excessive nervous irritability. I am even leaving almost untouched one great division of my subject—nervous lesions. I can only plead the vastness of the theme, and the impossibility of doing more than to make a brief presentation of it within the limits of a paper like this.

The importance of a more careful study of the physiology of nervous force is apparent when we remember that the type of American diseases is distinctly nervous, and that from year to year it is growing more so. Reflecting men in the medical profession have begun to recognize that we are making little progress in learning to combat these ills, and are seriously looking about for the reason. Some of the most profound thinkers in medicine have turned their attention almost exclusively to this field. They have advanced little further than to discover the cause of certain troubles, and lament the inability of the profession to grapple with and overcome the difficulty. Books have been written which have stirred medical men up to a recognition of the importance of this subject, without convincing their authors that they themselves fully comprehended the matter. Is it not time that investigation began from a new stand-point? Is it not time that inquiry took another direction? If any one has studied the subject from the vantage-ground of the correlation of nervous impulse with the other forces, I am not aware of it, but I hope that this may be a door which shall enable some one to enter upon a field that will give richer returns than any have yet yielded.

CLINICAL REPORTS.

PHILADELPHIA DENTAL COLLEGE—HOSPITAL OF ORAL SURGERY.

Clinic of Prof. James E. Garretson, M.D.

REPORTED BY CLAUDE H. BROWNING, M.D.

Removal of Parotid Gland.—The patient, a professional gentleman residing in Colorado, came as a private patient to the hospital

with a view to the extirpation of a parotid tumor of such magnitude as (using his own language) rendered life no longer bearable under its presence. The origin of the growth is referred to a sudden sharp crack in the neighborhood of the ear, heard by the gentleman as, some few years back, he was sitting at the open window of a car while crossing the Rocky Mountains, and the operation showed the meaning of the sensation to lie in a fracture of the styloid process of the os temporis. Measurement of the morbid enlargement gave four and a half inches vertically, three transversely, and one and a half in thickness. Fixation amounted to almost entire immobility. Diagnosis, fibro-enchondroma.

The operator, having the assistance of Profs. Agnew and Brinton, and of Dr. Hunt of the Pennsylvania Hospital, commenced the ablation by a first incision extending from the temple to a position upon the neck overlying the space of selection for the ligation of the carotid externus. A second incision extended transversely across the cheek, meeting the first adjacent to the antitragus of the ear. The incisions thus made affording two anterior and one great posterior flap, the tumor was uncovered, the cut below being made of a depth sufficient to expose the carotid, which vessel was lifted and tied. Attempts to dislodge the mass exhibited it as completely filling the zygomatic fossa, and at the same time inseparably connected with the periosteal structure of the maxillary ramus, both upon the external and deep face of the bone; similar relations existing with the mastoid process of the os temporis; the styloid, as suggested, was found fractured. The removal of the growth, which after an hour's labor, was effected by means of much dissection and careful manipulation (the latter particularly demanded on account of the insinuations, or prolongations, of the tumor into the spheno-maxillary fossa), was secured in a manner that admitted of no doubt as to the radical extirpation. After the ligation of the carotid not a single ligature was used, hemorrhage from the facial being controlled by digital compression at the time of uncovering. The subsequent clinical history of the case is given below.

After the operation the patient presented little or no evidence of shock, and there was no subsequent tendency to over-reaction, the resulting inflammation being moderate. The first few days following, the patient suffered from the inconvenience associated with a subacute pharyngitis; the secretion of much tenacious mucus, and the rapid accumulation of it, causing him to make repeated and violent efforts for its expulsion, occasioning much increase of the tenderness at the site of the wound, although throughout the entire progress of the case actual pain did not exist. On the fourth day following the ablation of the tumor, it was observed that a small

portion of the flap situated immediately in front of the lobe of the ear was sloughing and this was removed with a pair of scissors, thus bringing to view considerable dead tissue immediately underlying it, the separation of which brought to light a bright red granulating surface situated at the bottom of a cavity formed by the separation of the slough, and through which could be easily demonstrated the pulsations of the internal carotid artery, while pressure, being made upon the floor of the cavity, elicited certain peculiar tingling sensations, referred to the course and distribution of the pneumogastric nerve. The cavity now became the receptacle for quantities of pus, which seemed to be drained into it from adjacent tissues. Use of the probe showed the existence of a sinus, which led into a cul-de-sac, evidently situated between the two bodies of the masseter muscle. An incision into this cavity and the introduction of a tent, resulted in its drainage. This procedure was followed by a marked diminution in the amount of suppurative action, and repair went on rapidly and satisfactorily. The ligature around the carotid artery separated on the eighth day without accident.

On the sixteenth day the external condyle of the lower jaw, which had been divested of its periosteum, exfoliated and was removed; several smaller pieces of bone separating later. The local dressing consisted simply in packing the cavity with pieces of sponge saturated in phénol-sodique, compresses being properly adapted to the edges of the wound, and the whole confined with a bandage. The general condition of the patient up to this time was of the most encouraging character. Fever was almost entirely absent during the progress of the case, appetite and digestion remaining excellent.

A few days later a certain degree of stupor became evident, which increased to an alarming extent, and accompanying this lethargic condition was a slight amount of paralysis of sensation and motion on the right side. In spite of all that could be done the coma increased, and owing to the intense heat and great oppressiveness of the weather, it was considered advisable to send the patient homeward, with the hope that the change might be followed by an improvement in his condition.

On the 11th of June the patient was discharged from the hospital and sent to the home of his friend, Dr. Harris, in Chicago; to whom, had he lived, he would have owed a debt of gratitude it would have been difficult to pay, for the indefatigable attention and care which that gentleman bestowed upon him during his illness in Philadelphia.

A secondary danger that must exist in relation with the removal of a parotid gland is a necessary injury done to the cerebral lymphatic system. In the case of the present patient his death is reported

as occurring later in Chicago,. A post-mortem examination showed the cause of it to be an abscess that had formed at the base of the brain. The term used by Prof. Garretson as covering the circularity of such a result is "lymphatic stasis."

Resection of the Second Division of the Fifth Nerve, at the Base of the Skull, for the Radical Cure of Neuralgia.—The patient was a woman, aged 50 years, inclined to portliness; face much congested; features slightly drawn to one side; had a peculiar anxious expression, which indicated the great physical suffering which she had endured for ten years.

The neuralgia, to which this patient was a victim, was of a most aggravated character, and involved the whole course and distribution of the second division of the fifth nerve.

The forms of treatment which have been employed since the commencement of her suffering have been as multitudinous and varied as the practitioners to whom she has applied for relief. Many, assuming the trouble to be of dental origin, have extracted tooth after tooth until now little of her denture remains; yet there has not been the slightest amelioration of her trouble. The patient being etherized, the operator, with the aid of his clinical assistants, commenced the operation by two vertical and parallel lines of incision, running from the inferior border of the orbit to a position upon the cheek one and a half inches below. A second transverse incision connects the first two, thus making a trap-door flap, which being dissected from below is turned up. After the hemorrhage, which was somewhat profuse by reason of the great vascularity of the parts, had been controlled, the nerve is to be seen as it emerges from the infra-orbital canal, as fasiculi of white glistening fibers adherent to the under surface of the flap, which, by a little careful dissecting are easily detached. By means of the surgical engine, armed with a bur of sufficient size and revolving from twenty-five hundred to three thousand times a minute, the anterior face of the antrum of Highmore is cut away. The nerve at the infra-orbital canal is now caught by means of a hook and pulled out of the way by an assistant, while the operator, having changed the bur for one of more convenient size, proceeds to drill away the floor of the infra-orbital canal, passing quickly along it through the posterior wall of the antrum at its junction with the floor of the orbit, and into the spheno-maxillary fossa, in which position the nerve is resected as it emerges from the foramen rotundum.

The wound being thoroughly cleaned, the flap is accurately approximated by points of suture. Union was obtained in the case by first intention, and the operation was followed by complete relief.

PROCEEDINGS OF DENTAL SOCIETIES.

AMERICAN DENTAL ASSOCIATION—TWENTY-SECOND ANNUAL SESSION.

Third Day.—*Morning Session.*

(Continued from page 523.)

The consideration of Section VI, Pathology, Therapeutics, and Materia Medica, was resumed.

Dr. F. M. Odell, read a paper entitled "Diatheses and Cachexiæ," in which he urged the importance of the study of possible remote causes of pathological conditions. Diathesis was defined as "that weakness or tendency towards disease which is entailed by the law of heredity, and cachexia as that tendency in the same direction, arising by reason of the circumstances of environment, habit or experience of the individual." Cases of recession of the gum were described, in which treatment in the usual manner was ineffectual until the underlying diathesis or cachexia was discovered and the proper remedies were applied.

Dr. W. H. Atkinson. There are two sides to the question, both of which have been advocated in our literature as explaining the cause of the phenomena spoken of. The one is that hereditary tendency governs them; the other denies that there is any such thing as hereditary tendency, and maintains that some impact of unkindly force sets up every change. We must take the middle ground. In order to a proper understanding we must begin with the atom, and say whether there is anything in it which can determine the results; or if there is in it something latent, which only requires to be awakened. Remedies, to be efficient, must have an affinity for the elements of the molecular mass upon which they are to act. Pathology is really physiology; it means administration of function.

Dr. Friedrichs did not think any medical man knows the exact course which the medicine he administers takes in working its effect.

Dr. Atkinson. The feeder has to be fed upon a substance that has had a life-career—that must have been dead, but not effete. It may be either a food or a poison, by reason of the satisfaction or dissatisfaction of the typal demands.

Dr. Friedrichs. It has not been demonstrated in what way they act. We know nothing of that.

Dr. T. L. Buckingham, Philadelphia. We use medicine much as a lubricant is used in machinery; we want to make the machine move smoothly. We do know how medicine acts, to a certain extent. It assists nature in the performance of her functions. Certain

properties are inherent in the atoms of which the medicine is composed, but they are inert. It is only when they are combined that we get action. We do not know just the manner in which medicines act, but when we find by experiment that the administration of certain remedies is followed by certain effects, and when the experiment has been repeated a number of times with uniform results, we set it down as a law that this or that remedy produces the effect we have observed. We cannot tell whether medicines act as a whole or by chemical decomposition.

Dr. George Watt. Dr. Buckingham's statement that we don't know how medicines act is too general. We do understand the action of some medicines; we do not know how some others act. Our knowledge is partial. Take, for instance, the treatment of malarial fevers with arsenious acid. We administer the arsenic to kill the morbid tissue, upon which it acts, because of the lower vitality, without disturbing the healthy tissue; the dead matter is carried off by the emunctories. Take the case of an anemic girl; her blood is deficient in the red corpuscles. It has been found that iron is an important constituent of the red corpuscles of the blood, and we therefore give her iron in its most assimilable form in order that the proportion of red corpuscles may be increased. Even iron filings, dusted over bread and butter, will produce the effect desired. We know how this acts.

Dr. Buckingham. How does the arsenic act in malarial fevers?

Dr. Watt. It combines chemically with the albumen and kills the morbid tissue.

Dr. Friedrichs believed it was customary to know the cause of the disease for which treatment was instituted. Now, what is it that causes the fever?

Dr. Watt. Microscopy settles that question. The germs from a patient ill with malarial fever have been taken to the top of a mountain where malaria was unknown, and a person sleeping in a room in which without his knowledge they were deposited, has contracted the fever.

Dr. W. O. Kulp, Davenport, Iowa. Does not the administration of the iron on the bread and butter furnish us a hint?

Dr. F. M. Odell thought Dr. Watt had sufficiently demonstrated that he does not know how medicines act. To a certain extent we may know the action of medicines; but the *how* cannot be answered. Certain medicines must be assimilated to act; but how they produce their effects we have no means of telling. We only know that the medicine is present and is assimilated, and that the action follows. Other medicines act simply by their presence. Take subnitrate of bismuth; there is no assimilation of it, but certain effects follow its

presence. Dr. Watt says arsenic cures the malarial fever by killing the morbid tissues. The speaker thought we could come closer to its action than that. Arsenic has been proved to act upon the nervous system so that by the action of the medicine it gets a different movement. It is doubtful if it kills in the way he intimates. It seems rather to enable the system to work in a normal way.

Dr. Watt. We know that the lower organism dies in the presence of the arsenic. It gives the nervous system a chance to act by clearing out the débris. The system is always ready to act unless some foreign matters impede its course, and in this case the morbid matter must be regarded as a foreign body. During a prolonged administration of arsenic these dead matters are given off much more abundantly than at ordinary times. We know as much about the administration of arsenic as we know about anything. We don't know how the plow pulverizes the ground, or how the horse pulls the plow. In this sense we know nothing.

Dr. Odell. We profess to sneer at empiricism, but our science is merely the classification of what empiricism almost universally discovers. We have learned the way some actions go on—to a certain point—because some one has discovered for us that they produce a certain result, and we experiment to find out how it was done. We have learned that some medicines act on certain tissues, but how, except as the oxygenation of the blood is concerned, we know not; in this case we think we have it, but when we come to the action of any other medicine we have only the fact that it does act, and then we can only speculate.

Dr. Atkinson. We talk of tonics and stimulants, frequently without distinguishing the difference between them. Let us see if we can make a statement which will define the difference. There is no such thing in function as cell-action; all is molecular movement. The compact of energy which only awakens molecular movement without in any way adding to or subtracting from the substance of the molecules themselves is a stimulant; that which combines with the molecules and becomes a part of them is a tonic. A tonic is a food in every instance. Every atom has a side of energy and a side of statism. When we find it awakened into energy we do not know the immediate cause of its awakening. We cannot speak with certainty of causes and effects. We simply know antecedents and sequences.

Prof. Mayr. Dr. Watt says that arsenic kills low organisms. As bearing on this statement the speaker had had in his laboratory two bottles, both uncorked, the one containing a solution of arsenious acid, the other arsenite of soda. The surface of the fluids in both was covered with mold. In view of this he thought the power of

arsenic to kill these organisms was exceedingly weak. He considered that its action in malarial fever was due to its stimulation of the nerves, as stated by Dr. Odell.

Dr. E. T. Darby, Philadelphia. We don't know the action of arsenic on the pulp; it has been said by some that the arsenic was absorbed; others say that it acts by catalysis. Dr. Flagg, a number of years since, as an experiment, with one-twenty-fifth of a grain of arsenic on a piece of cotton devitalized ten pulps in the mouths of ten different persons, and then applied it to the web of a frog's foot, with the result of killing the frog. The drug was then weighed again and had apparently suffered no diminution of weight. The question is, how did it act?

Dr. Buckingham thought he knew something about that frog. He had been asked to analyze it, and on doing so, found what he believed to be arsenic all through it, but he had declined to sign a certificate to that effect. We know that when a pulp is killed with arsenic very little of the drug is absorbed. There is probably some chemical affinity between the arsenic and the tissues, but it is so weak that very little effect will be produced on healthy tissue. If arsenic is applied to a fresh wound it will be absorbed. We know that arsenic will prevent the germination of plants. We find, sometimes, where we have applied arsenic for the devitalization of pulps, that on the removal of the drug the pulps are alive, a small portion only having sloughed off. Arsenic seems to paralyze; if it were a true escharotic, it would destroy the chemical composition of the tissue to which it was applied.

Dr. W. W. Allport, Chicago. As regards Dr. Flagg's experiment, it object does not appear to be properly understood here. He thought what Dr. Flagg wished to convey was, that the devitalizing power of arsenic was not because of its absorption into the tissue, but that the presence of the arsenic acted simply as an irritant, causing a flow of blood to the part, and then there not being enough force to return it to the heart, strangulation at the apex ensued. He stated that after the arsenic had been in contact with the pulp for weeks there was only the slightest trace of absorption into the tissue, and that was at the exact point of contact. He had found that a pulp, when not wounded, required the smallest amount of arsenic to produce devitalization; but if the pulp has been wounded, a much larger quantity of the drug must be used. He had sometimes found that arsenic placed in a tooth did not cause devitalization, but weeks or months afterward he would be surprised to find a portion sloughing off at the point of application—the balance of the pulp remaining healthy.

The section was passed.

The committee appointed to draft resolutions upon the death of Dr. M. S. Dean, of Chicago, made an appropriate report. The report was adopted by a rising vote.

Section VII., Physiology and Etiology, was called, and the report was read by the chairman, Dr. Barrett. Its principal feature was the following resolution, which was reported for the purpose of carrying out the suggestion in the President's annual address:

Resolved, That the sum of $200 be set apart to be adjudged by a special committee of three members, to be appointed by the president of the association, to the author of the best paper on the etiology of dental caries, the paper to be based upon strictly original investigation, and to be presented to this association in the report of Section VII. Such committee shall prescribe the conditions upon which essays shall be presented, and in case of two or more papers of equal claim to merit they may in their discretion divide the sum so set apart and award a portion to each essayist. Unless papers of sufficiently original merit be submitted, the committee may decline to award the prize, and hold it over until it has been fairly earned. The competitors for the prize essay need not be members of this association, but the profession of the world is invited to the consideration of the subject.

Dr. Barrett read a paper on "The Origin and Physiology of Nervous Force.*"

Dr. Buckingham combated the idea of the conversion of one force into another. We must go back to the source of motion, which is force. How can we have two effects unless we have two forces? When you come to transfer life into thought you have what you cannot trace or explain. We cannot tell how nerve-force is transmuted into sound.

Adjourned.

Afternoon Session.

The afternoon session was devoted to the election of officers and the selection of the place for the next meeting, the report of which appeared in the DENTAL COSMOS for September.

Adjourned.

(To be continued.)

NEW YORK ODONTOLOGICAL SOCIETY.

. REGULAR meeting held May 16, 1882, at the office of Dr. H. G. Mirick.

President, Dr. S. G. Perry, in the chair.

INCIDENTS OF OFFICE PRACTICE.

Dr. John B. Rich. *Mr. President,*—I have this afternoon attended the funeral of one of my friends at Greenwood, where I was detained

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* See page 561, current number of the DENTAL COSMOS.

so late that I could not go to my home in New York to procure the paper which I had intended to present to the society this evening. This paper was on the "Disorganization of the Dental Pulp," and presented some phenomena on that subject, which, when they were brought to my notice interested me very much, and I thought they might be a matter of interest to the members of this society. As the facts are all fresh in my memory I think I can state the main points of interest without the written paper.

One of my patients, a girl, was quite a delicate child until she reached her ninth year; since that time her general health has gradually improved, until now, at fourteen, she has become quite healthy, and although not robust, she is strong, lithe and active, with a large amount of endurance and courage. She is of an active, nervo-sanguine temperament, has grown very rapidly within the past two years and is quite tall of her age. I commenced filling the teeth of this child before she was three years of age, and her teeth have been kept constantly under my care and supervision since that time. All of the deciduous teeth were filled and refilled a number of times while they remained in the mouth. The permanent molars and bicuspids, are of very poor quality; they commenced to decay as soon as they came through the gum; but all of the cuspids and incisors, which are large, finely-shaped teeth, have so far been entirely free from caries. The jaw is large, the arch is of good form, and the teeth not at all crowded, and although all of the molars and bicuspids have already been filled, some of them in several places, they are all alive.

The family to which she belongs resides every summer at the sea-shore on the south side of Long Island, and all of them take a large amount of out-door exercise, such as rowing, horse-back riding, croquet, lawn tennis, etc. The father of the family is a physician of moderate fortune, who is an enthusiast on the subject of physical culture, and is devoted to the care of his children, who all swim, row, and ride well. This girl, who is the eldest of the children, is an adept at all out-of-door exercises. I mention these details, as a knowledge of them makes the case quite a singular one, and I wish it to be understood that this child that had once been quite a delicate one, was, and to all appearances is now, in the most perfect health; in fact from her red cheeks and bright eyes, she may be said to be in blooming health. That was her condition when the present trouble commenced.

On the twentieth of last August (1881) this girl was brought to me from the sea-side, suffering from acute inflammation of the pericementum of the right central incisor; the face and gum in the region of the tooth were much swollen, the tooth very painful to the

slightest touch, and the suffering constant. I was informed that the swelling commenced two days before, and a few hours after, the tooth became painful to the touch. This occurred without any previous trouble with the tooth affected; there had been no pain in it, nor injury to it of any kind, and after the most exhaustive questioning on my part, I could gain no clue to the cause of the loss of vitality of the pulp; there had been no blow, no fall, no sudden shock that could be remembered to account for its condition. After her arrival in the city the pain increased and the suffering produced fever and a highly inflamed condition of the whole system. I relieved this by boring through the alveolus to the point of the root, and breaking up the sac formed there, and the next day drilled into the pulp-cavity, from the palatal surface of the tooth. I found the pulp decomposed into a dark-colored, fetid, semi-fluid mass, showing that the pulp had lost its vitality some time previous. I removed it, the inflammation subsided rapidly under the treatment, and soon after the root and pulp-cavity were filled; since then the tooth has not given any trouble, and as yet there is no perceptible discoloration. The family returned to the city the latter part of the following October, and on the 27th of November the gum immediately around the left superior *cuspid* began to swell, and a few hours afterwards the tooth became sensitive to the touch, and the symptoms rapidly developed into severe inflammation, which yielded to the means that had been found successful in the treatment of the other tooth. Upon boring into the cavity containing the pulp I ascertained that although it had lost its vitality it was not at all decomposed, showing that its death had been recent. Here were the same circumstances surrounding the death of this pulp that had manifested themselves in the case of the first one affected; no injury of any kind, and no premonitory symptoms indicating the change in its condition. On the seventeenth day of February, the death of the pulp of the *right* superior cuspid was made manifest by the development of precisely the same symptoms, and under similar circumstances, as had appeared in the case of the two teeth previously mentioned. And likewise on the second day of April the death of the pulp of the *left* superior central *incisor* was announced in the same manner, and attended by the same circumstances as the three that have been already described. In the three last-named teeth the pulps were not at all decomposed, and had every appearance of having been in a normal condition at the time of their death. Another phenomenon which was presented in this case was that during all the pain and inflammation that was successively developed in the last three of those teeth, when the death of the pulps was made manifest there was not the slightest indication of

pain or soreness exhibited in those whose pulps had already lost their vitality.

This case is in many particulars quite a remarkable one to me: that four teeth of good shape, that have not been affected with caries in the slightest degree, in the mouth of a healthy young girl, where the teeth are not at all crowded, and that have been kept scrupulously clean by the patient, should lose the vitality of their pulps within a period of eight months, without any apparent cause; and that the death of the pulps should have occurred in the order in which they did, without being contiguous to each other, but jumping from one side of the mouth to the other with considerable intervals of time between them, there being ninety-nine days between the first one affected and the second, eighty-two days between the second and third, and forty-four between the third and fourth, the condition of the pulps showing that they had not all lost their vitality at the same time. I at first thought that the death of the first pulp might have been caused by the sudden changes of temperature that occur at the sea-coast, but this theory would not account for the death of the pulps that occurred after she returned to the city. Upon inquiring of her father I found that there had not been any disturbance of the physical functions, as she had reached the period of puberty two years before this time, just before she was twelve years of age, and there had not been any constitutional change or disturbance since then. I have never met with a case in my practice before where such important changes have occurred, and without any apparent cause, and in the peculiar manner in which these have; so that I am free to confess that I am at a loss in this matter and hope the expression of opinion here to-night by my professional brethren may lead to the solution of what to me is at this time a mystery.

Dr. Shannon. Has the child been afflicted with malaria?

Dr. Rich. She has not.

Dr. Bödecker. Did you examine the pulps which you removed from these teeth as to whether there was any calcification, eburnification, or spiculæ of bone within the tissue?

Dr. Rich. I did not subject them to the microscope.

Dr. Bödecker. I think it very likely there has been a deposit or formation of dentine or bone in those pulps, as otherwise I don't think they could possibly die in that way.

Dr. Rich. This is a matter I was very anxious to have discussed at this meeting, for I have no doubt the pulps of the lateral incisors will go the same as the two others have. It occurred to me it might be a want of vitality in the child; I think the vitality is very low, and might that not be the cause?

Dr. Clowes. Except as to the matter of age, I have had two cases very similar to the one Dr. Rich mentions. The first was an old gentleman of perhaps sixty. His right lower canine was perfectly sound but much worn away by attrition. The irritation and exposure from this cause had destroyed its nerve, and ulceration ensued. I opened the pulp-cavity and removed its fetid contents. Beyond these, and caused by their presence, was a deep-seated and burrowing abscess. I filled the tooth and gave vent to the abscess, and as affecting them, the operations were successful. Some little time after this an abscess occurred on the same side at the root of a second bicuspid, which tooth was neither decayed nor worn away. This abscess was undoubtedly the direct product of the one which had burrowed from the canine. More recently, a lady came to me suffering from a right superior central incisor, which upon the slightest pressure upward gave great pain at its apex. There was no decay or discoloration about this tooth, but other evidence existed sufficient to warrant me in opening to the pulp from its lingual aspect. I did so, and found it without vitality. A peculiarity about this case was, that though subsequently receiving ease, the pain in connection with it did not wholly cease, but kept the patient in a nervous and fretful state. This led me to seek for some other solution of the problem of pain. I found it in the presence of several remnants of right superior molars. From the base of one of these an abscess had worked its way upward to the very floor of the antrum, and was separated from it only by the lining membrane of that cavity. It was just short of actual penetration. Here, then, was the "region of greatest disturbance," occupied by irritation, inflammation, and suppuration. About this time the first right superior bicuspid fell a victim to surrounding antagonisms and was added to the death-roll. This terrible array of diseased conditions gave way at last to appropriate treatment, and health, like a victor, resumed its sway. The lesson growing out of these cases is that dying and deceased dental pulps were the active causes and sources of evil.

Dr. Cook. As incidents of office practice, these cases are quite interesting, but what relevancy they have to the subject presented by Dr. Rich, I fail to perceive.

Dr. Clowes. To the sentiment expressed by the last speaker, I beg leave to dissent. Like causes produce like results, and therein lies the relevancy of my remarks. We are told of a paper that has been written containing full particulars of a most interesting and mysterious case. That paper, unhappily, is absent from this meeting, and we know very little of its matter whereon to base conclusions. One thing is certain, these pulps that have been spoken of were

dead; one "a fluid mass, the others not yet decomposed"—where the atrophy came in remains in doubt. But solid or fluid, they were defunct, and being such, were like unto those I have mentioned, and fully equal to them in their capacity for mischief. As to what caused the death of those pulps the absent record itself can give us no information. The whole case is a stupendous conundrum, which we are left to interpret if we can. There is nothing about it which astonishes me so much as that he, who has known the patient so early, so long, and so intimately, should come to us for information; that he, so rich in experience, so profound in thought, and so practical and thorough in the application of knowledge, should set us all to guessing, while admitting his personal inability to read his own riddle. Death comes to dental pulps in many ways—a blow, a shock, a lack of nutrition, abstruction, irritation, abrasion. That a seeming mystery exists in this case argues nothing against a probable solution whenever intelligent investigation is brought to bear upon it.

Dr. Jarvie. Are the laterals all sound?

Dr. Rich. Yes, sir; but these teeth died in this way with a girl ordinarily healthy; her father is a physician, a very intelligent man, and almost devotes himself to his children, and they are healthy-looking children, although this girl has become very thin and grown rapidly.

Dr. Shannon. Do you know whether she was in the habit of crushing ice a great deal?

Dr. Rich. Not that I know of.

Dr. Bödecker. I have to relate a case similar to this, although the death of the pulp was from a different cause. About four years ago, a young lady came to me with an alveolar abscess over the right upper first molar, which had a large but very imperfect gold filling in its mesial surface. When I removed this filling I found a good deal of pus escaping from the pulp-cavity. I rinsed this out as well as I could and discharged the patient for the time. I saw her again the next day, and the moment I removed the dressing the pus streamed out of the cavity in pulsations identical to the flow of blood from a wounded artery. After I had cured the abscess I filled the roots, and found that the palatal root had a large opening into the socket, which explained the free discharge of the pus. The pulp in dying had given no trouble, and probably died of atrophy.

The first and second bicuspids on the same side also had large but imperfect gold fillings in them, and the patient complaining of occasional pain in these teeth, I removed the fillings, and finding the dentine beneath quite sensitive, I filled the bottom of the cavities with oxide of zinc mixed up with a solution of carbolic acid, com-

pleting the fillings with oxychloride of zinc. About a year after this the lady returned, having an abscess over the second bicuspid of the opposite (left) side, which had given her no pain previous to that day. This tooth was perfectly sound. I treated and cured the abscess, filling the root of the tooth, and observed at the time that all the remaining teeth appeared to be alive. A few months later she came back to me having an abscess over the *right* upper *first* bicuspid, which I treated as before. But a short time after this the adjoining *second* bicuspid began to be very sensitive, and I found the pulp dead in this. About six weeks ago the patient again returned, having an abscess over the left upper *first* bicuspid; and now the four bicuspids and the first molar of the right side are dead teeth, all having died without giving the slightest pain. What is the cause of this I do not know, but I believe they all died from atrophy.

I have lately had another interesting case: A gentleman, about forty years of age, of good constitution and general health, was sent to me in October, 1879, for treatment of an abscess over the right upper lateral incisor. I diagnosed a dead pulp in the tooth to be the cause of the trouble, and attempted to enter the pulp-chamber from the palatal surface, but finding the dentine very sensitive, concluded that my diagnosis of the condition of the pulp was incorrect, and directed my treatment through the fistulous opening in the gum. With a spoon-shaped excavator I scraped away some of the alveolar process, thinking that possibly the cause of the abscess might be the forcing of some foreign body under the gum by the act of mastication, but I could find nothing of the kind. I treated the abscess with aromatic sulphuric acid for some time, but without avail. Eventually I removed a filling which had been put in the tooth some years before, and found that a part of the nerve had died, but I could establish no communication between the apex of the root and the abscess. I used various remedies after this, and finally have effected a cure. The tooth elongated somewhat, and since the cure of the abscess has been more sensitive than it was before. About six months after this abscess healed, the right lower canine and central incisor began to discharge freely around the necks. I tried various means of cure for this condition, but without success; finally, about three months ago, the left upper central and lateral incisors began to show signs of pyorrhea alveolaris. I made some applications of iodoform, which seemed to have had a good effect on the lower teeth, but the upper teeth did not improve at all until about two weeks ago, when I got the lateral under control. The central continuing in a bad condition, about three days ago I scraped away a good deal of the process and applied chloride of zinc, and to-

day the tooth looks decidedly better. I believe that from cicatricial tissue in the pericementum, which is formed when the inflammation subsides, bony spiculæ may arise, which pressing upon the nerve-fibers will give rise to extreme sensitiveness, especially if the tooth is moved to one side.

The President. We have with us to-night Dr. Reading, of Sydney. We should be pleased to hear from him.

Dr. Reading. I have been much interested in what I have heard, but I am prepared to say but little at this time. We have much trouble with the teeth in Australia, and from a very early age; decay often commences before the teeth are fairly erupted, and before the child is three years old the crowns are often completely gone. I account for this partly by the fact that all our water is surface-water and does not come from the rocks; in fact, we have no limestone country for miles around Sydney in New South Wales. The physicians there have in years past given lime-water to children for the purpose of improving their condition, but without apparent benefit. I have myself recommended a phosphate of lime to be used in bread and cakes, and some of the bakers there have made these articles in this way to some extent. Where they have been used for some time I think I have seen improvement in the condition of the teeth, but decay is not wholly arrested. Another cause for the frail character of the teeth of children there, I believe to be the precocious growth of the latter, especially in the northern portion of Australia, owing to the excessive heat of the climate. Children of fourteen years are like young men and women in development, but their teeth seem to be poorly formed and very thin in the enamel.

Dr. Jarvie. I suppose the cases presented by Dr. Rich would have excited more discussion had we not been as much at a loss to account for them as he is himself. While I have never seen a case in which so many teeth were affected, I have had a number of cases where this process had gone on with a single tooth, a sound incisor. There has been inflammatory action ending in the death and suppuration of the pulp without any apparent cause. I have had those cases in the mouths of patients from fifteen years old up. Last summer a young lady with the four superior incisor teeth perfectly sound came to me, having inflammation of the pulp of one of the centrals, which eventually resulted in the loss of the same. Dr. Bödecker asked if Dr. Rich had noticed whether there were any nodules of dentine in the pulp of that tooth he has spoken of. I have met, as all of us probably have, with cases of what are called pulp-stones, but I think that such are always attended with a great deal of pain before suppuration. The pain has been so intense in the

cases I have had, that I have been obliged to destroy the pulps to relieve it. I have had five or six such cases.

Dr. Bödecker. Dr. Jarvie probably forgets the case I related in my last paper, in which the two buccal roots of the molar were dead and the lingual root was alive, probably the cause of the dentinification of the pulp.

Dr. Rich. Usually the formation of bone in the pulp-structure is attended with pain, but in this case there was no pain at all until the suppuration took place. The first indication of pain was accompanied by swelling of the face. In that particular it was a remarkable case that so many teeth should die in that way. I expect to hear every day of the death of the two lateral incisors. This girl has been taking phosphate of lime and drinking lime-water for the past four years, and everything has been done to strengthen the bones of her system, and everything I could think of, and everything her father, who is a very eminent medical man, could do, has been done in her case.

Dr. Bödecker. Then this is identical with the one I related. In my case, the pain only came on after the formation of the alveolar abscess. My patient is of a first-class constitution, a robust, strong lady and was about sixteen years of age at the time she had the first trouble. I was not able to discover any decomposition whatever in this dead pulp. I had been looking for that, but all the pulps I supposed died from atrophy.

Dr. Cook. I would ask Dr Jarvie if the case which he related occurred at that early age Dr. Rich speaks of; and I would ask Dr. Bödecker at what age of the patient he found pulp-stones, osseous formations, secondary dentine or whatever he calls it, in the pulp. He just now said that the pulps died from atrophy in this young lady of sixteen, and he found no formation of dentine in the pulp. He rather leaves the inference that the formation was present in the pulp.

I think we wander from Dr. Rich's case in the discussion. I don't see in the main the relevancy of the cases brought up. It seems to me his is a very remarkable case and stands alone. For myself, although I have béen in practice a few years and have seen a number of patients, I must say that I never have had the good or bad fortune to see one of these cases come forward and die without some cause somewhere that you could by inquiry discover—that is, in my practice; I don't say that others don't find them.

Dr. Bödecker. I think Dr. Cook is somewhat at sea so far as the discrimination in the pathology of the pulp is concerned. My paper on this subject which I read before this body will, I hope, when published, make this point more intelligible. In that paper I defined

calcification, eburnification, ossification and dentinification. By *calcification* I mean a conglomeration of lime-salts within the tissue of the pulp without a visible arrangement of living substance. By *eburnification* I mean calcified masses in which there are visible traces of dentinal fibers. By *ossification* I mean a regular osseous structure with lacunæ and canaliculi in which there are regular protoplasmic bodies sending offshoots into the canaliculi. By *dentinification* I mean new formations in the midst of the pulp independent of the odontoblasts, the fibers of which run parallel, identically with those in primary dentine. Therefore when I speak of calcification I mean a mere deposit of lime-salts, but eburnification and dentinification are quite a different formation. These may be a source of irritation, but I do not regard calcification as such a source. In all my sections I have found only a limited number that did not contain traces of calcific deposit. I don't see that it can be called a pathological condition. I have very frequently observed that both ossified and eburnified masses within the pulp produced very serious disturbance.

Dr. Cook. At what age?

Dr. Bödecker. At every age I have been able to observe. I have examined a few pulps of deciduous teeth and found them to contain calcific deposits. In a wisdom-tooth taken from the mouth of a young lady of seventeen just as one of its cusps had made its appearance through the gum, I found the pulp full of calcifications.

Dr. Hill. I should like to say a little on this subject. I look upon this case as one of the most important ever brought before this body, and for two reasons. It is stated by a gentleman who is thoroughly posted on these matters, who is very careful in what he says, and knows precisely what he says. His patient is the daughter of a gentleman eminent in the practice of medicine who has brought that child up in the best manner possible for a healthy development. Here is a case that comes to us very clear, it seems to me. The medical profession is interested. He brings that before the Odontological Society, which professes to be authority—the best authority in this country on dental matters. It seems to me that for Dr. Rich to go back to that physician, and say that he brought that case before this society and hardly a gentleman replied directly to it, would place us in a position we should not be pleased with. If it is a thing that "no fellow can find out," let us say so. Here are several gentlemen who have for months, some for years, been lecturing to us on the pulp and its various diseases. It strikes me that here is a practical case where we may apply our knowledge, if we have gained any. We know that Dr. Rich is very careful as to his statements. He says he has no theory on this subject. Every dentist, when such a case as this

comes to him would like to account for it, if not for his own sake, at least for the credit of the profession.

Dr. Bödecker. In my paper on the dental pulp, I purposely left out the subject of atrophy, because I know nothing about it as yet. If I can get the material for investigation I will examine into this process, but it is very difficult to obtain, because when a pulp becomes atrophied and dies, it generally mummifies, and it is only accidentally that we meet with a recent specimen of atrophied pulp. I believe the pulps in Dr. Rich's case have died from atrophy, because, as a rule, there is no pain when the pulp dies in that way. We know that the current of blood stops in the pulp and the tissue dies. What the cause is I don't know.

Dr. Hill. Well, we have got so much clear, that the pulps did not die from external violence; they did not die from pulp-stones; they did not die from any of those causes with which we are familiar. He says they died from atrophy—that is the first positive point.

Dr. Clowes. Were the pulps in a moist condition when removed?

Dr. Rich. What do you mean?

Dr. Clowes. Were they in a soft or decomposed condition?

Dr. Rich. When I opened into the pulp-chamber of the right central incisor I found a dark fluid mass. The second case having occurred after they returned to the city decomposition had not taken place, nor had it in any of the others when the child was brought to me.

Dr. Clowes. My understanding of an *atrophied* pulp is one that has dried up, and being such is harmless and will not cause ulceration.

Dr. Atkinson. I would rather not attempt to diagnose any case without having a basis upon which to decide, for as sure as I did I should be quizzed. There has been enough said on the paper to attract our attention to it, so that when it is published it can be studied. There has been much said that I agree with and much with which I disagree. The ideas entertained of atrophied pulps indicate that men have not made their observations on adequate study. I know that it frequently is the case that persons carry atrophied pulps without knowing it, or without the practitioners having them in charge suspecting it, until pain is felt by the patient. If I were disposed to prophesy, I should say that many atrophied pulps would be found in the teeth of persons over thirty years of age without their having been aware of retrograde metamorphosis of any kind. When I say atrophy, I mean what the word signifies, lack of nourishment of the part, where it becomes as a wasted person, like the "living skeletons," as they are called.

There are a number of cases that I have studied; that is when nearly all the pulp-substance is absorbed and nothing but dried connective tissue remains. This is a question that is not well under-

stood, even by medical men. If I were asked whom I would seek to give me help in such a case, I should say the practitioners of dentistry, rather than the medical men. Medical men, all through our literature, take opposite grounds; one holds that carbonates and the other that phosphates enter the blood directly as minerals and all that; while others aver that all lime must enter the animal body through the vegetable kingdom.

My own impression is that soundness of the teeth is the result of vigorous use of the jaws. I have seen pulp-stones in the temporary teeth; if they appear in the temporary teeth it must be before the twelfth year of the subject; we need not lay so much stress upon the length of time the cases have run.

There is a great deal of loose talk on this subject, while there is a whole territory that has remained in the background by reason of the unwillingness of dentists to enter into it and to see what the microscope reveals, and take into account the impulse that excites the nutrient currents. It is only this that enables us to say how the hard part of the tooth is formed called calco-globine. Nasmyth's membrane is only connective tissue saturated with calco-globine; this in diseased teeth, is in a state of solution by the retrograde process. Where solution of lime-salts in situ takes place and afterwards resolidification occurs, we may observe what are called inter-globular spaces in the tissue, holding within their protoplasmic mass of jelly-like substance a perfect share of lime without canaliculi but with real calcification. At other times we will find this solid mass formed in consecutive rings without dentinal fibrils running through them, so that we have a solid mass that represents more nearly than anything else the section of a pearl,—true calco-spherite.

Dr. Bödecker. I have the pleasure of exhibiting before you here the chart or large colored diagram, prepared by our celebrated histologist, Dr. Carl Heitzmann, representing the minute anatomy of a tooth and its surrounding alveolus, of which I shall offer a brief explanation.

I shall begin by describing the enamel, which you observe (pointing to the chart) is colored blue upon the external surface. Here we see a row of elongated bodies representing Nasmyth's membrane, which, a little below the margin of the gum, blends with the epithelial covering of this layer. These columns here represent the enamel-rods, which are apparently divided by the striæ of Retzius into small squares. Between the enamel-rods (the basis-substance of the enamel) are visible the enamel-fibers with their lateral offshoots, identical with those of the dentine, but very much smaller. This portion represents the dentine; here are the dentinal (Tomes) fibers, running from their origin between the odontoblasts to the periphery of the dentine,

where, as a rule, they bifurcate. Between the dental fibers we observe the basis-substance of the dentine pierced by a minute network of canaliculi containing protoplasm. This layer here is the boundary of the dentine, and is called the granular (Tomes) or interzonal (Atkinson) layer. The outer surface of the root is covered with cementum, which in its lower portion is identical with bone; that is, it contains, as you see, lacunæ filled with protoplasmic bodies communicating by their coarser offshoots with one another as well as with the dentinal fibers. The boundary between the dentine and the cementum is established in four different ways. Here we observe bay-like formations where some of the bifurcations of the dentinal fibers are in direct contact with the coarser offshoots of the cement corpuscles. Another union of these two tissues is formed here where the basis-substance of the one gradually blends with that of the other tissue. A third variety of this boundary is depicted in this place, where long spindle-shaped protoplasmic bodies occupy the boundary. And, lastly, it may occur that the cementum is bounded by bay-like excavations, which are followed by a zone of irregular spindle-shaped enlargements, which by their large and long offshoots are in connection with the dentinal fibers, on the one extremity, and with the cement corpuscles on the other.

The neck of the tooth is not, as you observe, built up by regular cementum, but is composed of delicate spindles imbedded in a coarsely-granular basis-substance. The dentinal fibers do not quite reach the boundary of the cementum.

In this central portion we see the pulp with a rather abnormally large artery, but as the pulp is a comparatively small organ, it cannot well be depicted in correspondence with the rest of the tooth without being indistinct at a distance. The outer surface here is covered by the layer known as odontoblasts, between which we observe the dentinal fibers. The odontoblasts are connected laterally by fine processes, but on their outer extremities I have not been able to observe any processes. In the middle of the pulp we see four bundles of medullated nerve-fibers, two in cross-, and two in longitudinal section; the latter we can follow to here, where each of these fibers gradually loses its medulla, and as a bare axis cylinder is distributed between the odontoblasts.

This represents the pericementum, the structure of which is identical and continuous with the periosteum of the alveolus. There is, as you see, but a single layer of pericementum, consisting of bundles of fibrous connective tissue arranged obliquely; near the cementum, in many instances, it retains a myxomatous character, the meshes of which are filled with fat, myeloplaxes, other protoplasmic formations,

or a granular basis-substance. Several large vessels are seen entering the Haversian canals of the alveolus.

On both sides of the neck are represented the papillæ of the gum, covered, first with columnar, then with cuboidal, and on the surface with flat epithelia. In the papillæ are present loops of blood-vessels and nerves, the lymphatics not being visible.

This represents the alveolus evidently of an adult person, as it contains fat in the medullary spaces, which in the juvenile condition are occupied by medullary corpuscles. The roundish formations are the Haversian systems, with their central canals, around which we observe the lacunæ with their contents, and the lamellæ, arranged in somewhat regular circles.

Adjourned.

ODONTOGRAPHIC SOCIETY OF PENNSYLVANIA.

A stated meeting of the Odontographic Society of Pennsylvania was held October 4, the President, Dr. L. A. Faught, in the chair.

Dr. E. C. Kirk made the following remarks upon "A New Method for Bleaching Discolored Teeth:"

All processes for bleaching or restoring discolored teeth to a lighter color may be summed up under two divisions: First, those of a mechanical character, which consist in reducing the thickness of the walls of the tooth until they are more or less translucent, and then lining the cavity with a light-colored cement, which, seen through the thin walls of enamel, gives the tooth a lighter appearance. Second, those of a chemical character, by which a lighter shade is obtained through a true bleaching agent.

The mechanical method is objectionable in certain cases, from the fact that the amount of excavating that is necessary to reduce the walls of the tooth to a state of semi-transparency greatly lessens its strength and increases the risk of subsequent fracture.

Where the discolored tooth has so far decayed as to leave only the transparent walls of enamel standing, lining the cavity with a light-colored cement is no doubt the best method; but where the tooth is only slightly decayed and its walls are thick, a bleaching agent should be used which will not weaken it. The chemical methods which have heretofore claimed the most attention are all based upon the bleaching property of chlorine gas.

Having had considerable difficulty in bleaching discolored teeth satisfactorily by means of chlorine, I was led to make some experiments with a view to obtain results which would be permanent.

The greatest difficulty in any method that I am aware of, in which the active bleaching agent is chlorine, is to cause it to act through a

considerable body of dentine, without repeated applications, involving much time and annoyance.

Chlorine would undoubtedly give satisfactory results if it were possible to keep it in contact with the discolored tissue in sufficient quantity for an adequate length of time, but this object is defeated in all the methods yet devised for its use by two causes. When the pure gas is used, or its solution in water, a sufficient quantity cannot be retained in the pulp-chamber and cavity of decay to permeate the walls of the tooth unless they are extremely thin. When the gas is evolved from any of its compounds, such as calcium or sodium hypo-chlorite, packed in the cavity and moistened with alum solution or dilute acetic or oxalic acid, the decomposition is almost instantaneous, the gas being eliminated so rapidly that it escapes from the cavity without accomplishing its object, only a small portion acting on the dentine. This necessitates repeated applications, especially if the tooth-walls are of considerable thickness.

To thoroughly restore a discolored tooth to anything approaching its natural color, it is essential that the bleaching agent should permeate the dentinal tubuli as far as their discolored and decomposed contents extend, and this can only be accomplished by evolving the gas slowly and continuously for a considerable length of time within the walls of the tooth. With this idea in view, the following method was devised, which in its present application, so far as I am aware, is original: 100 grains of sodium sulphite Na_2SO_3, and 70 grains, or, more accurately, 69.841 grains of boracic acid, HBO_2, both carefully dried, are ground together in a warm, dry mortar to a fine powder. This is to be put into a bottle with an air-tight stopper and kept in a dry place.

Having adjusted the rubber dam to the tooth to be bleached and the one adjoining it on each side, the cavity of decay is to be cleansed of all debris, and the root solidly filled with gold or gutta-percha for one-half its length. The powder is then to be packed into the remaining portion of the pulp-canal and cavity of decay, leaving just sufficient room to insert a gutta-percha stopping. After the powder has been properly inserted a drop of water is allowed to fall upon it from a pledget of cotton twisted around a broach. Only enough water should be used to moisten the powder or make it thoroughly damp without washing it out. The cavity of decay is then to be quickly closed with a pellet of gutta-percha (preferably red base-plate) previously prepared of the proper size, and warmed. The patient can then be dismissed until the next sitting, when a second application can be made, which usually completes the operation, though where the tooth-walls are very thick and much discolored a third application may be necessary.

This method is based upon the bleaching power of sulphurous acid. When water is added to the mixture of boracic acid and sodium sulphite, a chemical reaction takes place, the boracic acid unites with the sodium of the sodium sulphite to form sodium borate, at the same time liberating the sulphurous acid which was originally in combination with the sodium and which is the active bleaching agent. Thus $Na_2SO_3+2\ HBO_2=2\ NaBO_2+H_2SO_3$.

The bleaching action of sulphurous acid on a tooth by the method just described is quite rapid, a very perceptible improvement in color taking place in from fifteen to twenty minutes. The gas is eliminated slowly and continuously for several hours, for the reason that the boracic acid which liberates the gas from combination with the sodium is a solid substance, not freely soluble in water, and the evolution can only take place as the boracic acid becomes dissolved, which requires a considerable length of time. Sulphurous acid as a bleacher seems to be fully equal in activity to chlorine, if not superior to it, so far as discolored dentine is concerned. It has no disintegrating action upon tooth-substance, and its results seem to be permanent; a tooth bleached by this method over a year ago shows no tendency to discoloration. The sodium borate resulting from the reaction is also without injurious action on the tooth; indeed, when teeth have been bleached by this method, I have noticed an increased hardness of their structure. Sulphurous acid bleaches by an entirely different method from chlorine. I am not aware that it possesses any advantage for tooth-bleaching by reason of this difference, but it is of interest from a chemical point of view and it is well to note it here, as future research may develop the fact that such difference is of importance. Investigation has shown that chlorine acts as a bleaching agent by reason of its strong affinity for hydrogen. Vegetable and animal colors, when brought in contact with chlorine in the presence of water have their color discharged from the fact that the hydrogen of the water is seized upon by the chlorine, and the oxygen set free oxidizes the color and destroys it, chlorine in this case acting *indirectly* as an oxidizing agent. Sulphurous acid, on the contrary, is a reducing agent by reason of its affinity for oxygen, in combining with which it becomes oxidized to sulphuric acid, H_2SO_4.

On the chemical character, therefore, of the coloring matter depends the choice between sulphurous acid and chlorine for bleaching purposes. Chlorine should be used when the color is an oxidizable compound, or rich in hydrogen, while sulphurous acid would apply more particularly to substances highly oxidized and capable of being reduced. The same course of reasoning would apply to their use as disinfectants and antiseptics—properties which they both possess in a marked degree.

I have presented to you in a brief manner the outlines of a process I have had occasion to use from time to time for the past eighteen months. While conscious that it is still far from perfection, I have every reason to feel considerable satisfaction with the results obtained. Further investigation may show that better results can be produced by some modification of the ingredients of the bleaching powder. A change which I have recently made, consists in the substitution of boric oxide $B_2 O_3$ for boracic acid, in the proportion of sodium sulphite 200 grs., boric oxide 111 grs. Theoretically this gives a little over 1 per cent. more sulphurous acid gas than the first formula given. Both mixtures are made by combining the powders used in their proper equivalent proportions, by which two results are obtained—a complete disengagement of *all* the sulphurous acid in the compound, and the production of a neutral inert residue without injurious action to the tooth.

If the method which I have outlined is employed by any member, I shall be glad to hear the results or to learn of any improvements made.

Dr. Eisenbrey stated that he had never had any success with bleaching methods depending upon chlorine or its compounds. He always found that a tooth bleached by chlorine had a tendency to return to its discolored condition. He had obtained better results by the mechanical method, which consisted in removing as much as possible of the discolored tissue with excavators, and then lining or filling the cavity with a light colored cement, such as Houghton's Os-Artificiel, over which a permanent filling of gold could be inserted. He believed that a frequent cause of the re-discoloration of teeth that had been bleached was infiltration of secretions about the neck of the tooth from without inward. He was glad to hear of the new method of Dr. Kirk, and would glve it a trial.

Dr. Boice said that his experience with all the methods he had used was that the tooth bleached had a tendency to discolor again in from three to six months. He obtained the best results by hot air and the rubber-dam. He applies the rubber-dam to the tooth to be bleached, removes all debris, then injects hot air into the tooth for some time with the hot air syringe, after which he fills the cavity with white gutta-percha, carefully warmed, so that it will be sure to stick to the walls of the cavity. This operation is to be repeated at intervals of three or four days, until the desired shade is obtained.

Dr. Tees said that he received a letter last spring from a prominent dentist of Pittsburg, asking for information in regard to the bleaching of teeth. A lady patient was very anxious to have the color of a central incisor restored, and as he had tried the ordinary bleaching agents and failed, he wished to know if there was any-

thing new to accomplish the purpose. As Dr. Tees knew of nothing, before answering the letter he conferred with one or two professional friends, who he had reason to believe were well posted upon the subject, and found that their experience with chemical agents was the same as his, unsatisfactory; that they cut away the dentine and filled with oxychloride. He was glad to learn that Dr. Kirk had been so successful with this agent, and hoped the paper would be published for the benefit of the profession. The bleaching of teeth is very important practice, as we often meet with discolored teeth, especially incisors, which it is very desirable to save. He had given as a reason for attending society meetings so punctually that he always learned something at each meeting, and acknowledged that he had learned something this evening.

Dr. Chupein believed it was necessary that a bleaching agent should thoroughly penetrate to the ends of the dentinal tubuli in order to properly bleach a tooth and prevent any return of discoloration. He described a modification of the chloride-of-lime method, in which he used powdered citric acid to bring about the decomposition of the bleaching powder. By this method the evolution of gas took place more slowly and for a considerable length of time.

The President inquired if Dr. Kirk had used the sulphurous-acid method in those cases of discoloration resulting from extravasation of blood into the substance of the tooth.

Dr. Kirk stated that he had only used the method in one such case, where the discoloration was produced by a sudden extravasation of blood following an arsenical application to the pulp of a lateral incisor of very dense and fine structure. This case required daily applications for nearly a week to thoroughly restore it. He had not seen the case since, and was therefore unable to report as to the permanency of the operation.

The President stated that he had been conducting some experiments with a view to producing a better quality of engine burs than he had been able to procure. By careful selection of the material and good workmanship he had produced a bur of excellent wearing qualities. He would report further upon the subject in the near future.

Dr. Chupein described a form of bur which he had formerly used and liked very much, but which he had not found in stock at the depots for some time. The peculiar arrangement of the cutting leaflets permitted of a pushing cut, while the burs made at present allowed only of a draw cut. Four vertical leaflets were cut upon the sides of the bur, extending across and intersecting one another at right angles, upon the end. Then four more leaflets were cut between these, which met at the point of intersection of the first ones

upon the end of the bur. With an instrument of this character a cavity could be deepened as well as enlarged laterally.

Dr. D. N. McQuillen presented a model of a case of irregularity and an appliance which he had used successfully for its correction, which had been suggested to him by Dr. Neall. The case was one of projecting incisors of the upper jaw. The correcting appliance consisted of a saddle of vulcanite over the molars and bicuspids, and attached to this a band of vulcanite, running around in front of and impinging upon the labial surfaces of the incisors, which were caused to move back by simply warming the vulcanite band and bending it in from time to time, causing it to press with some force upon the teeth to be moved.

Dr. Boice suggested a modification of this plate by making the band of stiff gold and using wooden wedges between it and the teeth to be moved. By this method he had moved back the six front teeth with very little difficulty.

Dr. Chupein described a method of making temporary plates for the mouth with the gutta-percha used for base plates. By using plain teeth a plate of this kind could be made, in an hour and a half, sufficiently firm to last until a vulcanite plate could be made. He had read of temporary plates of this kind lasting from six months to a year, thus giving the gums ample time to shrink after extraction of the teeth.

Dr. Boice had seen plates made in the manner described by Dr. Chupein that had done good service for several months.

E. C. Kirk, *Secretary.*

AMERICAN ACADEMY OF DENTAL SCIENCE.

The fifteenth annual meeting of the American Academy of Dental Science was held at Young's Hotel, Boston, Mass., on Wednesday, October 25, 1882.

The morning session was chiefly devoted to the regular business and to the selection of the following-named officers: Dr. G. T. Moffatt, president; Dr. J. H. Batchelder, vice-president; Dr. H. F. Hamilton, recording secretary; Dr. E. B. Hitchcock, corresponding secretary; Dr. E. H. Smith, treasurer; Dr. H. C. Meriam, librarian; Dr. C. P. Wilson, Dr. E. C. Briggs, and Dr. J. S. Mason, executive committee.

Dr. S. J. Shaw and Dr. F. E. Banfield were elected active fellows.

The afternoon session opened with the annual address, by Dr. Frank Abbott of New York, on "Dental Education." The paper was chiefly devoted to emphasizing the necessity of young men's having a thorough medical education as a preliminary to the study

of dentistry, and the need of Massachusetts following the other States in obliging practicing dentists to have a suitable degree or to pass an examination before a State examining board. Dr. W. H. Atkinson, of New York, read a paper on "Artificial Teeth," giving valuable ideas on the subject, and on the healing of tissues. He unqualifiedly condemned celluloid and vulcanite as base-plates. Dr. A. W. Buckland of Woonsocket, R. I., read a paper describing a method of filling by covering a lining of cement with amalgam while both are in a plastic state. He deprecates the use of gold and severe methods with patients needing gentle treatment.

Resolutions were passed on the death of Dr. J. E. Fiske, of Salem, and Dr. W. H. Allen, of New York, both honorary fellows of the Academy.

The annual dinner took place at five o'clock. Many distinguished dentists from other cities were present, and the meeting was one of the most valuable, both professionally and socially, ever held.

BROOKLYN DENTAL SOCIETY.

The Brooklyn Dental Society held its fifteenth annual session October 9, 1882.

Officers for the ensuing year were elected as follows; Dr. A. H. Brockway, president; Dr. F. W. Dolbeare, vice-president; Dr. C. P. Crandell, recording secretary; Dr. W. H. Johnston, corresponding secretary; Dr. F. C. Walker, treasurer; Dr. L. G. Wilder, librarian.

C. P. Crandell, *Recording Secretary*,
508 Clinton Avenue, Brooklyn, N. Y.

OHIO STATE DENTAL SOCIETY.

The Ohio State Dental Society will hold its seventeenth annual meeting at Columbus, Wednesday, December 6, 1882, continuing three days.

The State Board of Dental Examiners will be in session during the meeting of the society. For information address the secretary of the board, Dr. F. H. Rehwinkel, Chillicothe, O.

W. H. Sillito, *Secretary*, Xenia, O.

BIBLIOGRAPHICAL.

Dental Metallurgy. A Manual for the use of Dental Students. By Charles J. Essig, M.D., D.D.S. Philadelphia: The S. S. White Dental Manufacturing Co., 1882. Price, $1.75.

This volume, as stated in the title, was designed, and we may add is especially *adapted*, for students in dentistry. The intent of the

author was to supply in a compact volume, the special knowledge of metallurgy required in dental practice. He has succeeded in making it the best book of its class which we have seen, supplying a want which all dental students must have felt. Most of the works on metallurgy, while treating more or less exhaustively of the various metals have but little of the special information which is required in dental metallurgy, and, to arrive at that which has significance for his employment, the student must needs read much that is irrelevant.

It is exceedingly difficult to condense into a small volume all the important matter contained in the larger treatises on the same subject, but the author has succeeded remarkably well in producing a book that contains the essential and practical information of the more elaborate works on metallurgy, combining with it the technical teaching applicable to dental mechanism.

There are some slight errors in the volume, but none that will mislead the student.

The book is divided into twenty-one chapters, the first seven of which treat of the metallic elements, properties of the metals, alloys, amalgams, modes of melting metals, and the combinations of metals with non-metallic elements. The next thirteen chapters are devoted to the history of metals; process of procuring and reducing ores, refining metals and preparing them for use, special consideration being given to those most commonly employed by dentists.

We commend the book to dental students, believing that its study cannot fail to give them a fair comprehension of metallurgy in its relations to dental uses.

T. L. B.

Speech and Its Defects. By S. O. L. Potter, M.D. Philadelphia: P. Blakiston, Son & Co., 1882. Price, $1.00.

This little book is a thesis which recently obtained the first prize at the commencement of the Jefferson Medical College. It is an interesting compilation of the history, causes, and methods of treatment appropriate in cases of stuttering or stammering. No allusion is made to the effect of irregular, delayed, or imperfect dentition in influencing vocal sounds, either directly by absence or stunting of certain teeth, or indirectly by altering the shape and relation of the alveoli and the palatine arch. The author's conclusions as to treatment of stuttering are that no benefit is to be expected from surgery and but little from electric or medicinal treatment, except as adjuvants; that the tricks resorted to by charlatans are of merely temporary benefit, and that the only rational treatment is continuous, unremitting disciplinary exercise of the vocal, respiratory, and articulating organs.

On Slight Ailments, their Nature and Treatment. By Lionel S. Beale, M.B., F.R.S., Second Edition, Enlarged and Illustrated. Philadelphia: P. Blakiston, Son & Co., 1882. Price, $1.25.

We called attention to the first edition of this book in a previous number, and repeat our indorsement of it as a volume which students of medicine, young practitioners, and intelligent laymen may read with profit. It is full of wise counsel—the fruit of the extensive experience of its learned author—as to the causes of various ailments and how to avoid them.

The Physicians' Visiting List for 1883. Philadelphia: P. Blakiston, Son & Co.

This is the thirty-second year of the publication of this excellent Visiting List. This issue contains a new table of poisons and their antidotes; the metric system of weights and measures, and tables giving doses of remedies in both the present system of apothecaries' weights and measures and in that of the metric system. It is compact in size and convenient in arrangement.

OBITUARY.

DR. WILLIAM H. ALLEN.

Died, in New York, October 23, 1882, from cancer, Dr. William H. Allen, in the sixty-second year of his age.

Dr. Allen was born at Medway, Mass., in 1821, resided at Norwich, Conn., for fifteen years, and went to New York in 1857, where he succeeded to the dental practice of his brother, Dr. Charles C. Allen, whose pupil he had been. He was one of the founders of the New York College of Dentistry, and became its first president. At the time of his death he was clinical professor of operative dentistry in the college and president of the board of trustees. He was also a member of the First District Dental Society of New York.

Dr. Allen inherited an inventive faculty from his father, which he utilized in his profession by improvements in dental instruments and in other directions. He had some considerable ability as a contributor to dental and scientific literature. He had many years' successful practice in New York, always stood high in the profession, and his death will be generally regretted.

JOSEPH THOMAS CLOVER, F.R.C.S.

Died, at Cavendish-place, London, England, September 27, 1882, from pulmonary disease, Joseph Thomas Clover, F.R.C.S., in the fifty-seventh year of his age.

Dr. Clover was lecturer on anesthetics at University College

and formerly chloroformist at the Dental Hospital, London, England. He was born at Aylsham, Norfolk, in 1825. His important inventions and literary contributions relating to anesthetics constitute his claim to distinction. Notwithstanding his long-continued defective health, from chronic pulmonary disease, he was an indefatigable worker in his profession of surgeon.

After a general education at Grey Friars Priory, Norwich, Dr. Clover became a pupil of the late Dr. Gibson, a surgeon of high standing and large practice in that city. In 1844 he commenced his studies at University College, London, where he was regarded as one of the most promising students of his time. After filling various minor positions, in 1848 he was made the responsible head of the working staff of the hospital, and became resident medical officer, holding that position for five years, during which the cholera epidemic of 1849 occurred, and when the administration of chloroform was frequently resorted to. In 1853 he settled in practice in Cavendish-place, and soon had a large measure of success. Declining health, however, in later years, caused his relinquishment of general practice, and the restriction of his labors to the administration of anesthetics, in which department he soon became pre-eminent, and was the associate in their operations of many of the chief surgeons and dentists of London.

Aside from his professional distinction, Dr. Clover was a man of high character and of modest demeanor, and in his intercourse with others was sympathetic and singularly devoid of selfishness. He left surviving him a widow and four children.

PERISCOPE.

New Method for the Cure of Salivary Fistula of Stenson's Duct.—When an opening is made, through any cause whatever, in the course of Stenson's duct, the wound either heals easily or the anterior portion of the duct contracts and becomes obliterated, the saliva continuing to flow out of the fistulous orifice. In the last case, a salivary fistula of Stenson's duct is established, and has no tendency to close, since the anterior portion of the duct is no more able to transmit the secretion of the parotid gland. It is evident that an operation alone can remedy this morbid condition, by re-establishing the continuity of the salivary duct in its course along the tissues of the cheek. Many methods have been recommended for the cure of this infirmity, on account of the difficulties inherent to the subject, the different opinions of surgeons, and the different clinical forms that a fistula may assume, according to its cause, its precise seat, and its local complications. In case of complete obstruction of the orifice of the duct, the aim is always to create a new issue for the saliva into the buccal cavity by establishing a kind of internal salivary fistula on the soft parts of the cheek.

On this principle, Leroy, Monro, Desault, Duphœnix, Deguise, and Béclard have proceeded in very different ways, which I will not enumerate, as they are to be found in most treatises on the subject. I will only remark that the practice of introducing, as Monro recommends, a seton which goes through both the thickness of the cheek and the fistula, is an uncertain way of restoring the normal course of the canal, because the presence of the thread prevents the closure of the fistulous orifice in the cheek; and, when the thread is removed, that orifice remains open, and resists all endeavors to close by means of a suture, if the anterior portion, previously formed and maintained for a time by the seton, should contract and close, as generally happens under the circumstances. The principle that we must follow, is to succeed in obliterating the fistula in the cheek during the period that the saliva is being conducted into the mouth by the artificial aid of a seton, and not after the seton is withdrawn; for this conduction of the saliva once more along its proper course is the essential condition for the obliteration of the fistula. To apply this principle, care must be taken that the artificial anterior part of the duct is not only permeable when the fistula in the cheek is sutured, but is also kept open by artificial means as long as the sutured fistulous orifice remains imperfectly closed. From this point of view, Duphœnix's cannula seems to me, *à priori*, superior to Desault's seton, and even to the method of Deguise; but I repeat that my aim is not to criticise in detail facts already known.

A case of salivary fistula has recently been under my care, where, from its very nature, I have been able to carry out the above principles: and this after a method differing in certain respects from any hitherto adopted. The method I have originated seems to me worthy of the attention of the profession, because it may, if I am not mistaken, be practiced in almost all cases of salivary fistula, and because it has, over the other methods known to be efficient, the double advantage of being simple and easily tolerated by the tissues involved in the operation.

Alfred Weber, aged 42, stoker, was admitted at St. Louis Hospital ward, St. Augustin, No. 22, in August, 1881, when I was in charge of Dr. LeDentu's patients. This man had been shot through the right cheek twenty-five years previously; the jaws are now practically anchylosed, as they can only be parted to the extent of one millimeter; the food is introduced in very small fragments over a broken tooth, and is swallowed without mastication. For the last two years, the health had been perfect, and the idea of an operation after the principles of Esmarch or of Rizzoli, to mobilize the jaws, was abandoned.

The patient entered the hospital for the cure of a salivary fistula of Stenson's duct, which was, like the anchylosis, the result of the old wound, and which had its seat on the posterior part of the duct, on the surface of the left masseter. This complication had passed through different phases; from time to time an abscess, below the fistula, had formed on the surface of the masseter; as soon as it opened, the fistula closed on the saliva and began to flow by the orifice of the abscess. As long as the latter was kept open by a thread or by a drainage-tube, the abnormal orifice of the duct remained closed; but when the abscess was allowed to heal, then the fistula

immediately reopened, and allowed the parotid saliva to escape. The patient had often been subjected to these vicissitudes, and he had come to beg us to put an end to this unpleasant condition of affairs. When admitted, the fistula itself was closed, and at its site there remained a small scar, slightly depressed and of solid consistence; three centimeters, almost vertically below the scar, was the orifice of an abscess, and a little more in advance, on the surface of the buccinator, was a second orifice similar to the first; both these orifices of the abscess were made a few weeks before admission by a surgeon; they were connected by a drainage-tube, and the patient knows by experience, that if the tube were removed and the abscess left to heal, the fistula would open again. The saliva flowed abundantly, particularly after meals, through the anterior orifice of the abscess, on a level with the buccinator. In fact the posterior part of Stenson's duct discharged its saliva, no longer through an abnormal orifice on the duct, but into the cavity of the abscess, which formed, as it were, an ampullary enlargement of the duct; and the saliva escaped on the outside by the anterior opening of this enlargement, which lay in a better position for the discharge of saliva than did the posterior opening.

In considering the anterior orifice of the abscess as the real fistula to be healed, I felt that my task had become relatively simplified. That orifice lay on a level with the buccinator, and I could penetrate into the mouth by a short and direct incision. I therefore proposed the following plan of operation. Firstly, a trocar was to be plunged through the anterior orifice of the abscess alongside of the drainage-tube, and brought out on the surface of the buccal mucous membrane at the site of the normal orifice of Stenson's duct. Then, with the help of the cannula, I intended to pass one end of an India-rubber tube, fastening the other end to the drainage-tube previously inserted into the abscess. On pulling the old tube backwards, the extremity of the new tube could be brought out of the posterior orifice of the abscess. The new India-rubber tube would then occupy the newly formed canal and the abscess to its full extent, leaving the fistula free from any foreign body. I next proposed to close the fistula by a stitch or suture, as soon as the saliva had begun to flow regularly and freely into the mouth. The new India-rubber tube would then be removed, so that the posterior orifice of the abscess alone remained open; its closure would be the last stage of proceeding, and not likely to be difficult, because any wound communicating with Stenson's duct would readily heal when no obstruction remained to the regular discharge of the saliva.

In attempting to re-establish the salivary channel by a drainage-tube, I could not anticipate with certainty that this means would be sufficient; but I deemed it expedient to attempt a method very simple in its execution, and which the tissues could easily tolerate; such was the double motive which *à priori*, diverted me from the other methods recommended by Duphœnix, Deguise and Beclard. I am going to relate now the result which attended this operation.

The operation was performed on August 25. I perforated the cheek with a hydrocele trocar; I then inserted the tube in the proposed method, and, at the same time, sutured the fistula. Some swelling and slight pain came on a few days later; carbolic acid

injections were administered through the tube; but the suture broke down, and the saliva began to flow through the fistula again.

This first failure seemed to me easily explained; the inflammatory swelling after operation compressed the drainage-tube, and the saliva, unable to flow through it or around it, found its way again through the fistula. I then proposed to insert a larger tube, pierced with a greater number of holes; and I determined to undertake the operation patiently, in two stages, at different periods, so as first to insure the patency of the canal by organizing the new passage, and only attempting the obliteration of the fistula after the canal had become perfectly pervious.

I waited until the inflammatory swelling had passed, and soon the drainage-tube, that I had inserted on August 25, could once more slide freely amidst the tissues; then I substituted for it, on September 3, a tube much larger and provided with a greater number of holes. At the same time, I perceived that the fistula had become contracted —a proof that the presence of the first tube had already partly deviated the course of the saliva, although the patient himself could give no precise indication in this respect. For an instant I was led to believe that, with the new tube, one or two cauterizations with nitrate of silver would be sufficient to obliterate the fistula.

Things were then left *in statu quo* until the middle of September. During that fortnight, the saliva continued to flow through the abnormal orifice, especially after meals. But some of it ran also into the mouth, as the patient began to notice; and, after each meal, he pressed the cheek from behind forwards, so as to force the saliva towards the buccal cavity. Ere long, the parotid secretion, through this practice on the part of the patient, flowed chiefly through the new channel, and the fistula became almost dry. Thus I had reason to believe that, after all, the India-rubber tube would be sufficient to re-establish the salivary passage, and that I was not far from attaining my object.

I inserted the suture on September 17, carefully applying carbolic dressings. I took great care not to remove the drainage-tube; because, as I said in the beginning, the newly-formed salivary passage had to be maintained by artificial means, as long as the cicatrization of the fistula remained incomplete.

On September 24, I removed the suture. The fistula was closed, nothing flowed to the outside. The patient, however, continued to squeeze the cheek, which favored the course of the saliva. Finally, in the first week in October, the saliva flowed naturally, and without any difficulty, into the mouth. The scar appearing solid, and the new canal through the cheek well established, I decided, on October 13, to take out the drainage-tube.

Only the posterior orifice of the old abscess now remained to heal. As I had foreseen, it soon closed almost spontaneously, and on October 17, the cure was perfect. The patient was kept under observation till the 22d, and he then left for the Convalescent Hospital at Vincennes.

Briefly, I may recapitulate the steps of the operation thus: Following classical authors, I created an internal salivary fistula by maintaining a foreign body in the tissues. I employed for that purpose an India-rubber tube, as being easy to put in place, and easily toler-

ated by the patient. Moreover, I took advantage of a special feature in the case to let the posterior extremity of the drain come out of an abnormal orifice situate behind the course of the saliva. This afforded me the opportunity of leaving the fistula free, while the canal in the cheek began to form itself; then obliterating this fistula in due time, and finally maintaining the artificial canalization during the time necessary for the consolidation of the cicatrix. If I was somewhat delayed, it was because I had not determined on a sufficiently clear course from the beginning, and I had not conceived at first, in its successive stages, the method which ultimately proved successful.

I believe that there would be an advantage in employing in most salivary fistulæ of Stenson's duct, as the only dressing, a drainage-tube; and, moreover, in following as matter of principle the method I conceived, which was inspired by the presence of an abscess, and bearing a posterior as well as an anterior orifice. The operation may be summarized as follows:

1. Plunge a trocar backwards through the fistula, and bring it out through the surface of the cheek, so as to create a posterior orifice situated out of the course of the saliva. Insert a provisional seton in place of the trocar.

2. Perforate the cheek obliquely forward through the fistula, and insert an India-rubber tube, the anterior extremity of which issues through the mouth.

3. Fasten the posterior extremity of the tube to the provisional seton-thread, and let it come out by the newly-created orifice, so that a loop of rubber tubing shall fall behind the fistula, but not in contact with it.

4. Close the fistula by suture. Before the suture is formed, it is necessary that the inflammatory swelling excited by the tube be reduced, and that the saliva should flow into the mouth with comparative ease. After suture, wait until the course of the saliva is perfectly free, in the right direction, and the cicatrization of the fistula perfectly solid before the tube is removed.

In this method there are two new points—the use of a rubber tube and the formation of a posterior orifice. These are the advantages I have found. Nothing is so easy as to pass a drain in the way I have described. The cannula of Duphœnix, the wire of Deguise and Béclard cannot be so well borne, neither are they of so ready an application. Admitting the tube as the only instrument for dressing, how should it be used? To pass it simply from the mouth to the fistula, is simply to establish the unfavorable condition I have noticed in the beginning of this paper, when criticising the Monro method. It is impossible to obliterate the fistula without first removing the seton. It follows that the saliva in the presence of a canal of recent formation and of a sutured wound as yet imperfectly healed, is as likely to force the wound as to follow the new channel. If, on the other hand, the rubber loop leaves the fistula free, and passes behind it to reach a posterior orifice, it follows that the more the new channel becomes expanded and pervious, the more the fistula will cease to transmit saliva, and will tend to become obliterated. After allowing the seton time to permanently establish the new passage, nothing is left but to close the fistula, itself almost ready to close spontaneously. The cure will be most perfect when

the operator has patience to await the proper time for the removal of the drain.

But it may be said that the creation of a posterior orifice is only altering the difficulty, by substituting for the fistula another posterior to it. To this I would respond that this posterior orifice is not in the condition of a true fistula, because it is placed outside the course of the saliva; and, moreover, the moment the drain is withdrawn, the channel is restored, and nothing will prevent the free circulation of the parotid secretion, consequently the cicatrization of a wound which is in communication with Stenson's duct.

In conclusion, the method I have put in use deserves at least another trial, because it has, in my opinion, the merit of great simplicity, and answers all therapeutic indications.—*Dr. Richelot, in British Med. Journal.*

Tuberculosis of the Tongue.—Dr. Thomayer, of Prague, describes three cases of tubercular ulceration of the tongue. In one a wide fissure existed about the middle of the dorsum, with yellow-coated base, and prominent coarse tubercular nodules at its margins. In both lungs there was widespread tubercular disease. In the second case the ulcer occupied the right half of the tip of the organ. and was characterized by numerous firm granulations in part of its base, the rest being covered by a thick yellow layer; the margins of the ulcer were also firm, beset with gray and yellow granulations. The ulcer bled slightly, and was not benefited by treatment. The third case was similar, only the ulcer was seated on the frenum. It was treated by the topical application of chloride of zinc, which produced only temporary benefit in the breaking down of the nodules. Microscopical examination was made of the diseased organ in the two fatal cases. The ulceration had destroyed the mucous membrane and submucous tissue, and the base was formed by a thick layer of small rounded cells, intersected here and there by muscular bundles. Beneath this layer, there spread into the inter-muscular spaces masses of similar cells, which, under high powers, were found to consist partly of giant-cells, and to be separated by the delicate stroma of tubercle. Some isolated tubercles were found deep in the substance of the organ. The muscular fibers themselves seemed invaded by the cell-growth, which was not limited to the inter-muscular spaces. There was proliferation of muscle nuclei and of endothelium of the blood-vessels. Dr. Thomayer says that the extent of the lesion demonstrates the futility of treating these ulcers by caustics, and points to the advisability of excision.—*Lancet.*

Epilepsy Dependent on Dental Irritation.—Mr. Henry Moon related a case of epilepsy cured by the removal of dental irritation. The patient, a girl aged twenty-one, was brought as an out-patient to Dr. Fagge at Guy's Hospital, and he, finding that her teeth were in a very bad state, sent her to Mr. Moon. She had suffered from fits since she was fourteen, and lately they had become so frequent as to reduce her almost to a condition of imbecility. On examining her mouth, Mr. Moon found a third molar in process of eruption; this he lanced freely. Some of the other teeth were extracted and others stopped at the Dental Hospital; treatment by bromide of

potassium was ordered at the same time. The result was that the fits entirely ceased from the day of her first visit to the hospital. The girl soon regained her intellect, and, although she was kept under observation for several months, no recurrence took place.—*Proceedings Odontological Society of Great Britain.*

Nerve-Stretching in Neuralgia.—MM. Hairion and Warlomont report, in the *Annales d' Oculistique* (February, 1882), an interesting note by M. Coppez on a case of constant facial neuralgia of twenty years' duration cured by elongation of the affected nerve.

The unfortunate patient had been the prey of numerous dentists, who, at his own request, had taken away more than half the jaw on the diseased side, leaving him poorer in teeth and money than before, but quite as well off as regards the pain. On entering the hospital, he presented all the signs of facial neuralgia,—redness of the skin, lacrymation, acute pain, etc. M. Coppez performed elongation of the infraorbital nerve with the happy result of a complete disappearance of all pain.—*Revue Scientifique.*

Malaria and Dental Hemorrhage.—Dr. Guenard, (*Journal de Médecine de Bordeaux*, May 7, 1882), after a somewhat extended examination of cases of hemorrhage coming on after the extraction of teeth, comes to the following conclusions respecting this: Among the numerous causes of internal origin which lead to and keep up hemorrhage after the extraction of teeth, should be included malarial infection, either recent or old. In certain cases where there are no obvious symptoms present of malarial infection, quinine sulphate will yield very good results. In conjunction with ordinary hemostatic methods, and those particularly adapted to dental hemorrhage, quinine sulphate should always, in obstinate cases, be administered. —*Chicago Med. Review.*

An Undescribed Disease of Infants.—Dr. Riga (*Movimento Med. Chir.*) has observed a pernicious disease of the mucous membrane of the child's mouth. It consists of the formation of a false membrane between the end of the tongue and the frenum. The membrane is round and small. Children in whose mouths this appears lose strength rapidly, refuse to nurse, and ninety per cent. of them die. The disease has been observed only in summer and is always associated with intestinal catarrh. It lasts from two to eight weeks. It is found in children only during the first dentition; it is not contagious, but appears to be infectious. In the Terra di Levoro the disease has been endemic for sixty or seventy years. During the past decade, there has been no diphtheria in that region. No scientific study of the disease or membrane has yet been made.—*Physician and Surgeon.*

Atropin for Dribbling from the Mouth.—Dr. G. F. Yeo says, in the *Lancet*, that often, in cases of paralysis, and sometimes in fracture of the skull, dribbling from the mouth is a most distressing symptom; it saturates the pillow and robs the poor patient of much needed sleep. A little atropin injected under the skin, in the neighborhood of the gland, checks for hours the flow of saliva and enables the sufferer to enjoy a quiet sleep.—*Med. & Surg. Reporter.*

Lesions of the Teeth in Locomotor Ataxy.—At the meeting of the French Association for the Advancement of Science, on Aug. 30, a communication was made by M. Th. David upon lesions of the teeth found in locomotor ataxy. The paper was based upon the observation of a single case, and the following are the most important of the conclusions arrived at from an attentive study of it. The alteration consisted of a rapid decay of the anterior part of the crown of almost all the teeth. The altered substance assumed the consistence of touchwood and a reddish color. The enamel still retained its polish, but not its hardness. Beneath those parts the pulp had produced a new layer of secondary dentine, and in most of the front teeth the pulp-cavity was filled up. These alterations had nothing in common with caries, and must be referred to nutritive disturbance resulting from the lesion of the central nervous system. The changes are analogous to those which have already been observed to take place in the nails in the course of locomotor ataxy; they would thus establish a pathological relationship between organs already connected by a common epithelial origin. Locally, these alterations recognize for their immediate cause a functional disturbance or a lesion of the dental pulp. The atrophy which has been shown to exist would be quite comparable to that which is observed in the eye under similar circumstances. Whence the final conclusion that we must attribute to the dental pulp the physiological significance of a sensory organ.—*Medical Times and Gazette.*

Necrosis of the Lower Jaw.—A specimen of necrosis of the lower jaw was presented by Dr. A. C. Post. It was removed from a patient about ten days ago, and was somewhat interesting with regard to the etiology of the affection. About two years ago the patient had a bicuspid tooth extracted from the lower jaw, but as it broke, a considerable portion of the tooth was left behind. He had no trouble with it until eighteen or twenty months afterwards, when he began to suffer from inflammation about the jaw, and not long afterwards an abscess opened and these specimens of bone came away. The parts healed well after the remaining fragment of tooth had been removed.—*Proceedings N. Y. Pathological Society, in Phil. Med. Times.*

Iodoform in Dentistry.—Dr. Scheff, of Vienna, recommends iodoform, by virtue of its quick caustic action, as a means of relieving the pain of exposed dental nerves, especially as a substitute for the more severe caustic, arsenious acid, the application of which is attended with so much pain and is frequently followed by periostitis. The advantages claimed for the remedy are that, while it is an efficient caustic, it produces no irritation, much less any inflammation of the periosteum, and leaves no scars. In addition to this, the combined action of iodoform as a cleansing and disinfectant application to wounds renders it a more desirable caustic, especially when inserted beneath a temporary filling or for capping the exposed, though not yet decayed, pulp.—*Cincinnati Lancet and Clinic.*

A New Cause for Mercurial Poisoning.—Two cases having recently come under our notice in hospital practice of mercurialism

in men employed in exhausting the little globes used in the incandescent system of electric lighting, we think a brief notice of the fact will be interesting, and may perhaps call forth more information from others. In each instance the gums were swollen, spongy, and tender, and there was salivation. The patients were employed in the same room, and both knew that mercury was the cause of their ailment. So far as we could gather from their account, the poisoning must have been due to mercurial vapor from the exhausting pumps, as no mercury was used except that contained in these pumps. From the statement of one of the patients we should infer that all those employed in the room would suffer from these symptoms, and have to give up the work in less than a year.—*Med. Times and Gazette.*

The Connection between Mechanical Injury and Caries of the Teeth.—* * * Mr. Steele, of Croydon read a paper under the above title, in which he expressed the opinion that the influence of mechanical injury as a primary cause of caries had not received the attention which its importance deserved. Caries was probably due to an acid condition of the fluids of the mouth, causing decomposition of the earthy constituents of the dentine. So long as the enamel was perfect, it appeared that the dentine was safe from the ravages of this disease. But if it was imperfect, whether from congenital deficiency, or as the result of undue concussion, or from being unfairly used, the acid fluid obtained access to the dentine, and serious results followed. More pains should be taken to impress upon young people especially the importance of not abusing their teeth. They should be assured that in subjecting these organs, which appeared to them so hard and strong, to all sorts of rough treatment, they were laying up for themselves serious trouble in the future. He felt sure that the spread of a better knowledge of the evils of mal-treatment would be followed by a perceptible diminution in the ravages of dental caries.—*Proceedings Odontological Society of Great Britain in Med. Times and Gazette.*

Improved Styptic Colloid.—Collodion, 100 parts; carbolic acid, 10 parts; tannin, 5 parts; benzoic acid (from the gum), 5 parts. Mix in the above order, and perfect solution is effected. This preparation is of a brown color, and leaves on evaporation a strongly adherent pellicle. It instantly coagulates blood, forming a consistent clot, and a wound rapidly cicatrizes under its protection.—*Louisville Medical News.*

The Use of Gutta-Percha in Regulating Cases.—Mr. Walter Coffin then read the paper of the evening, on the use of gutta-percha for taking impressions in regulation cases. Gutta-percha possessed many advantages over plaster for this purpose, not the least of which was that it was much less disagreeable to the patient; but partly owing to the use of inferior samples, and partly to improper methods of working, it had been generally abandoned as unreliable. The directions given in text-books and sent out by the depots would inevitably ruin the best gutta-percha so far as its fitness for impressions was concerned. The proper method was as follows: A cup or tray was chosen to fit the dental arch; then gutta-percha, in toler-

ably thin sheets, was placed in boiling water, when it immediately softened. It was then taken out on a glass rod, just dipped into cold water, and fitted into the cup. The filled cup was then placed in the hot water for half a minute, just dipped into the cold, then placed in the mouth, and the patient was told slowly and steadily to close the jaw upon it. It should be kept in the mouth for a minute and a half or two minutes, then carefully released from the bite, and at once placed in a basin of cold water, where it should be left until it was convenient to take a cast of it. Mr. Coffin then described the tests for good gutta-percha, and mentioned some other purposes connected with dental surgery for which it would be found useful.—*Proceedings Odontological Society of Great Britain.*

HINTS AND QUERIES.

"He that questioneth much shall learn much."—Bacon.

Correspondents desiring a reply in this department are requested to make use of *distinctive signatures or initials*, and avoid the practice of signing their communications Reader, Subscriber, etc.

Correspondents who wish notice to be taken of their communications should authenticate them with their names. We cannot insert queries or replies except they are so accompanied. Names not necessarily for publication.

Soon after placing rubber dam on left central, preparatory to filling it, for a lady 30 years of age, of nervo-sanguine temperament, in good health, the tooth changed color, from a bluish white (its natural color) to a pink. No difference in sensation was felt on account of the change of color. I removed the dam and within five minutes' time the tooth had become natural in color. I again applied the rubber when the pink color returned. I filled with "Weston's Cement," which remained in the tooth for two weeks, and it regained its natural color within a few moments after the removal of the rubber as before. After two weeks I applied the rubber when again the tooth turned pink as before. I filled the cavities (two approximals) with gold. It has been three months since, and the tooth remains of a pink color, but has never been sore from the operation. Will some one tell me the cause of the change in color.—A. C. F.

I would be obliged if some one would inform me of the best method for lining vulcanite plates with gold, what number of gold to use, etc.—R. M. B.

Caries of Inferior Maxilla, with Fistulous Opening underneath the Chin, of Dental Origin.—Louis T. H., aged about 22 years, attorney-at-law, called February, 1882, for consultation. Previous to any examination he stated that in September, 1880, the first indication of any abnormal condition was an enlargement underneath the chin, and in a brief space of time a fistulous opening was formed through which there was a free discharge of pus. The tumor increased in size till it was about as large as an ordinary walnut, when, becoming alarmed, he consulted a physician, who pronounced the growth an epithelioma, and advised its removal, which was subsequently done in as thorough a manner as possible considering that the original cause of the affection was obscure. The wound was treated for a short time as is common in such cases, but showed no disposition to heal entirely.

About three months after this operation the patient not being satisfied with the

result, and under the conviction that he had an incurable cancer, called as above stated for consultation and examination, although his father had about determined to send him to New York for treatment. Inquiring about the condition of his teeth, he replied that he had never suffered from them, but on further inquiry as to whether he had ever received any injury from a blow or otherwise in this locality, he stated that about twelve years ago he had been thrown from a horse, receiving a fracture of the skull in the region of the occiput, at which time he remembered having a trifling corner broken from one of the inferior incisors, but from which he suffered no pain or inconvenience. In fact, at no time since the occurrence until presenting to me did he suffer the least pain in the parts affected. I made a careful examination; the anterior teeth were apparently sound, there being no indications of decay, but to the left of the median line immediately over the apices of the roots of the central and lateral teeth the gum-tissue was inflamed, the line of demarkation between the normal and abnormal gum being very perceptible, and there was a hypertrophied condition of the base of the alveolar process. The fistulous opening underneath the chin was situated to the right of the median line and about one inch posterior to the maxilla. A probe was introduced into the fistula, leading to the base of the jaw. On the left central and lateral incisors a slight difference in color was shown, but so little as to cause doubt as to their being devitalized. An opening was made through the central, the instrument readily dropping into an empty pulp-chamber. A Donaldson nerve-bristle was then passed through the tooth, and with but little effort through the body of the bone, emerging at the fistulous opening. The lateral incisor was treated in like manner with similar results.

Caries of the bone of dental origin being fully diagnosed, the two teeth above named were extracted. This being done the case was treated for about one month by injection of aromatic sulphuric acid, carbolic acid, and iodine, alternating the former with the two latter in a dilute form. These were forced through but reached the orifice of the fistula in very small quantities, owing to the minuteness of the opening through the border of the bone. At two different times the orifice healed, but opened again, and the discharge recurred in a more aggravated form.

A more heroic treatment was decided upon, and the operation was performed by the aid of the dental engine in the following manner: Assisted by Drs. Jacobs and Rivalles, the patient was etherized and a grooved director was passed to the bottom of the fistula and an incision made the entire length of the fistulous track to the border of the bone. The soft tissues were dissected away, exposing the bone, which presented a healthy appearance. Not being able to find the carious opening by external probing, this was effected by passing the Donaldson nerve-bristle through the alveoli of the extracted teeth. A trephine, such as is used on the S. S. White dental engine, was next brought into requisition, the engine being operated at the highest degree of speed possible by an assistant, when the trephine passed readily through the external plate of bone into the carious pocket; a large-sized bur was then used for the purpose of enlarging the opening made by the trephine and the carious interior thoroughly broken up and removed. The opening through the alveoli of the extracted teeth was then enlarged in a similar manner, enough to admit of free injections and to give exit to any remaining debris, which was thoroughly washed out by the aid of a suitable piston syringe charged with a solution of alum-water for the purpose of arresting the bleeding, which, however, was very slight. The operation was completed by removing a portion of the scar from the result of the former operation, and also the remains

of the fistulous track or canal. In so doing the submental branch of the facial artery was severed, the hemorrhage from which was at once arrested by torsion.

The opening through the bone was next injected with aromatic sulphuric acid, full strength, and a carbolized tent passed through, allowing an end to project from the alveoli in the mouth and also underneath the chin. The parts were then brought together and retained by five stitches and protected by adhesive strips. The patient suffered no inconvenience from the operation, but walked home, a distance of a mile. The following day the tent was removed and the aromatic sulphuric acid again injected, taking the precaution to protect the soft parts by a free application of cosmoline before so doing. For six days after the operation the tent was introduced, gradually diminishing its size, and injections were made, as before. The incision healed rapidly, with the exception of that portion on a line with the opening in the bone, which was purposely kept open in order to afford perfect drainage and admit of free injection. After the sixth day the injections were of a mild form and alternated by using carbolic acid, iodine, and sulphate of copper. The case was thus treated daily for about one month, the object being to have the opening gradually fill up with new bone, which it did in a very satisfactory manner. The opening in the soft tissue underneath the chin healed up entirely in the course of a few days. I then saw the patient about three times weekly, injecting through the alveolus, as a matter of cleanliness to the parts, as long as a trace of the opening remained.—William B. Miller, D.D.S., *Altoona, Pa.*

Experiments with Plaster of Paris.—These experiments were made with the object of obtaining the maximum of hardness with the minimum of expansion.

The tests were made in a full upper celluloid blank with various plasters, mixed in various ways, and with other materials, viz., alum, salt, sand, and marble-dust. The expansion of the cast prevented it from fitting again in the blank, and showed the space between them, which varied from one to five thicknesses of note-paper.

Tests of various plasters:

1. The best S. S. White plaster, mixed plain (*i. e.*, without alum, salt, etc.), showed the least expansion, but was much the softest after setting.
2. The best plasterer's plaster, mixed plain, set hard, with moderate expansion.
3. Coarse builder's plaster set very hard but with great expansion.

Different samples of plaster, even when apparently alike, acted quite differently, especially when mixed with alum, some then becoming too porous and soft for any use, though setting hard without it. Most of these experiments were made with a sample of the best plasterer's plaster which worked well with alum.

Tests were made in mixing plaster:

1. Mixed thick, and stirred about ten seconds.
2. Mixed thin, and stirred about a minute.
3. Mixed of medium consistence, and poured immediately.

Contrary to expectation, the last showed equal hardness with the two former, and but about half their expansion.

Further experiments were made on this line, testing the effects of duration of stirring and consistence of the "mix," on the hardness and expansion of the cast. Firstly, three mixes were made, stirred the same length of time, but of different consistences.

1. Mixed very thin.
2. Mixed very thick.
3. Mixed of medium consistence.

The last showed greatest hardness and least expansion. Beyond a certain con-

sistence, casts are not made harder by thick mixing, friability and porosity coming in to counteract the hardness gained thereby.

The next test had reference to duration of stirring. From the same cupful of plaster were poured

1. Mixed medium thick and poured immediately.
2. Mixed medium thick and stirred two minutes.

The latter set almost immediately after being poured, expansion commenced very quickly, and continued till by next day it had increased to at least five times that of No. 1. It was also the softer. So much for thick mixing and long stirring.

Thus, it was found that by mixing plaster of medium consistence and pouring immediately the casts made thereby *set harder*, *expanded less*, *and the expansion set in much slower* than by any other mode of mixing; the only drawback being that it set more slowly.

It still remained to be seen whether the same good results would accompany this method of mixing when alum was used. Three casts were made to test this, which clearly demonstrated that the same good results followed that method.

Tests were made to decide if thickness of the model affected the space made by expansion between its roof and the blank:

1. A cast was made about one-sixth of an inch thick. 2. Another was half an inch. 3. About one inch. 4. About two inches. Contrary to expectation, that two inches thick showed no more expansion than that of only one-sixth of an inch. So with the others.

Experiments were then made by mixing with plaster, sand, marble, salt, and pulverized alum.

Marble-dust.—This did not perceptibly increase the hardness or affect the expansion.

Sand.—This seemed to increase to some extent both the hardness and expansion.

Salt.—This materially lessened the expansion and increased the softness. It reduced the expansion of the S. S. White plaster to practically nothing. It also hastened setting when used in small quantities. The more salt used the softer was the cast but the smaller the expansion.

Alum.—About ten grains to the heaping tablespoonful of plaster gave the best results, reducing expansion to the minimum. I first mix the alum with the water, then the plaster. After some search I found a plaster which would set hard with alum, much harder than without it; but most plasters set soft with it; and *all* softened very much on boiling, and remained so when dry. This was the great objection, and mixing with sand or marble-dust did not remedy it. For closing flasks with wet heat this is objectionable, so much so in some plasters as to absolutely contraindicate the use of alum, especially with celluloid.

Tests were made of casts in water:

1. A cast mixed with alum and boiled about an hour became soft, but did not expand, and even seemed to have slightly contracted.

2. A cast mixed thick, without alum, etc., and boiled for an hour, softened slightly and expanded.

3. A cast ordinarily mixed, soaked in cold water several hours, showed no appreciable softening or expansion.

An important point noticed while conducting these experiments was that the casts continued to expand for two or three days, and that for a few minutes after setting the expansion was imperceptible, indicating that this period should be seized for obtaining the model from a plaster impression, and that the model

should be used as soon as possible. After a few days expansion ceased. I have made plaster set harder by drying it, over a fire for an hour or two, before mixing. It must not be used while hot.

It is well known that casts can be hardened by heat, expelling the water of crystallization. Perhaps it is not so well known that casts thus hardened become much softer in boiling water than if not so dried. In fact, this drying can be carried so far as to render them readily pulverized under slight pressure.

I am informed that the best results can be obtained by mixing plaster, alum, and water; then re-calcine.—STEWART J. SPENCE, *San Francisco*, *Cal.*

HAS not the necessity for the mallet in cohesive-gold work been largely overestimated? It is not a pleasant remedy, and certainly cannot be regarded as a physiological one. I do not believe it *is* a necessity. I have inserted quite a number of fillings, both ordinary and contour, without any malleting, and have had the satisfaction of seeing afterwards that they were to all intents and purposes as good as if they had been hammered in with the full force of an "automatic." I may not be up to "concert pitch" on this subject, but I am strongly of the opinion that gold, when thoroughly annealed, will make a sufficiently substantial filling by hand-pressure alone, and that malleting, except possibly in extremely large contours (certainly nowhere else), is "non-compensating." I use soft gold and an annealing tray, heating until two pellets will adhere quite firmly when made to touch each other, and using direct from tray to cavity. Nothing new about this—certainly not. But if a sufficiently good filling can be made without the mallet, why use it? The adaptation can be made quite as perfect with hand instruments as by malleting, and I do not think there is any more danger of porosity if care has been taken and pellets have not been too large.—A. MORSMAN.

BURS.—Supplementary to the paper of Dr. Guilford in the October issue of the DENTAL COSMOS, let me add the following:

1. Burs, and in fact any of the instruments of the engine, should never be used for opening cavities. I have seen operators using them to the entire exclusion of chisels! No wonder, in such a case, that the teeth of the instrument should very soon assume the unevenness in figures 3, 4, and 5, of Dr. Guilford's sketches. The bur, to my mind, was never intended to cut enamel, except when the cavity is opened and it is used to finish the edges. But a better thing than any steel instrument for edges is corundum stone.

2. Burs should be thoroughly cleansed every night with a stiff polishing brush on the lathe; kept free from dust, and used as much as possible in dry rather than in wet cavities. They were never intended to exclude the use of spoon and other excavators. But they are frequently abused to such an extent, that the same instruments are used to remove dentine one moment and to cut gold solder the next.—W. G. B.

"REX," Lincoln, Neb., shows by his retort to my criticism of his first article, that where there may be a seemingly wide divergence in views and practice, yet a courteous and kindly candid discussion may show the divergence to be immaterial. Query: Would the same spirit, if adopted by Dr. Flagg and his fierce opponents, lead to similar results? Or would it only serve to clear away the verbiage and personalities that obscure their real positions and confuse the earnest seeker for truth? In either case, would it not be better to strenuously guard against the use of language that will anger an opponent unnecessarily.—W. E. DRISCOLL.

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ORIGINAL COMMUNICATIONS.

LIFE AND VITALITY.

BY J. L. WILLIAMS, LEWISTON, ME.

DURING the past year I have noticed in the reports of the transactions of many dental and medical associations quite frequent criticism of the use of the term vitality. I believe that there is reason for this criticism, because of the ambiguous manner in which the term is used, and the uncertainty as to the meaning which those using it really intend to convey. But the term when intelligently used is one which cannot well be spared from our vocabulary, and it is my purpose in this paper to show that it may be used with as much scientific exactness as the term irritability or chemical affinity.

There are at the present time not a few scientific teachers, men of scholarly attainments and profound thought in the line of their work, whose influence is being widely felt in the direction of their efforts to reduce biology to a problem of mechanics.

Accepting Mr. Spencer's definition, as the best that has yet been proposed, that "life is the continuous adjustment of internal relations to external relations," the efforts of these disciples of the school of "affinities" and "oxidations," seem to be, first, to reduce the first co-efficient in the problem to terms which shall also, in their ultimate rendering, be but another way of expressing the last, and thus to them the only co-efficient in the problem. They desire that the "last analysis" shall show only "external relations." The method is grossly unphilosophic, and unless science ends a long way before philosophy begins, it is also grossly unscientific.

The phenomena of life everywhere present *qualitative* as well as quantitative relations; but a long-continued habit of contemplating a problem from one point of view only, produces at last an almost complete inability to grasp an intricate problem in all its relations. Even in the use of such terms as chemical affinity and gravitation,

which are supposed to express with mathematical precision relations of matter which may be demonstrated to sense, there enters the coefficient of quality as not the least important of the two.

Properties should never be mistaken for entities. Chemical affinity or gravitation does not draw atoms or aggregations of atoms together. They are only abstract expressions by which we indicate something of the *qualitative* relationships of matter. Herein lies the error of the materialist; he is constantly mistaking the *method* by which matter under certain conditions acts, for the *cause* of the action; and he persistently refuses to recognize the fact that man's consciousness is related to the phenomena of life as exhibited in matter by a very narrow scale of three degrees,—touch, sound, and sight; the other senses being only modifications of the first. A low degree of motion we call the sense of touch; that motion increased, our consciousness recognizes a new quality which it calls sound; still further augmented, it speaks a second time through the sense of touch as heat; a more intense action reaches consciousness as light, and then, as the brain is unable to report more than 800 billions of vibrations in a second, the activities of matter pass beyond the scope of our consciousness surrounded by a halo of intense violet light. Above and below this narrow scale roll the infinite tides of life. Inasmuch, then, as man knows so little of the purely material aspects of life, it behooves him to be exceedingly careful in making statements which imply that he has taken into the account all of the qualifying conditions.

Now let us briefly examine some of the phenomena of life as revealed to us through this narrow scale or window of our consciousness. Neither idealism nor materialism is alone a sufficient guide in interpreting life. In endeavoring to understand a phenomenon we should consider it in the light of a knowledge of every ascertainable condition.

Life is both objective and subjective, and its conditions may sometimes be approached only from one side. If we are approaching from the objective side, then idealism, both in methods and terms, should be rigidly excluded. On the other hand, if we are approaching the problem from the subjective side, then materialistic methods must be abandoned for the time.

From an objective point of view an organism may be said to be a mechanism, the relations of which may be expressed by a mechanical interpretation. We recognize the presence of phenomena in organisms, which belong to physical and chemical agencies. But an organism is something more than a machine. As I remarked in my reply to Prof. Mayr, in the March number of the *N. E. Journal of Dentistry*, "Any theory of the origin of any form of organic existence

which fails to recognize the subjective condition of life must end in darkness and confusion." And I may now add, that any attempt to explain the perpetually recurring phenomena of organic existence which ignores the subjective factor in the problem, must also end in darkness and confusion. It is always well to first express all that is known or can be learned of the physical or chemical relationships of organisms in physical and chemical terms. But every such relationship or change so expressed is simply a change of position determined by some preceding change. Now, movement implies force, and the *nature of the forces* in operation must also be taken into the account. While it is true, as Prof. Mayr has remarked, that the progress of biology has forced those who make the word vitality a sort of makeshift, or a screen behind which to hide their ignorance to "pitch their tents a little further west;" or in other words, while such progress has shown more and more the machine-like adjustment of the several parts of an organism, and the possibility of explaining by physico-chemical changes many things concerning the phenomena of organic life which were formerly attributed to the agency of some super-physical, mysterious principle, it has *also shown more and more* the intervention of conditions which it is not possible to explain from an objective point of view.

When the term vitality or vital force is made to stand for some mysterious principle, some unknown cause dissociated from all known conditions, then it becomes a negation; it means nothing, or it may mean anything. Vital force as an extra-organic agent has no existence.

If the conditions governing chemical changes in an organism were identical with those under which such changes occur outside of an organism, then there would be no use for such terms as vitality and vital force. But every careful observer knows that there is something in an organism which sets at defiance and sometimes wholly frustrates what we call chemical affinities. The instances cited by Lewes are to the point. He says: "Even the ordinary laws of diffusion are not always followed in the organism. The amœba, though semi-fluid, resists diffusion when alive; but when it dies it swells and bursts by osmosis. The exchange of gases does not take place in the tissues precisely as in our retorts. The living muscle respires; that is, takes up oxygen and gives out carbonic acid, not on the principle of simple diffusion, but by two separable physiological processes. The carbonic acid may be given out even when there is no oxygen whatever present, and its place may then be supplied by hydrogen; and this physiological process is so different from the physical process which goes on in the dead muscle that it has been proved by Ranke to go on when the temperature is so low that all putrefaction is arrested."

The whole period of the cycle of existence of a living organism is that of continuous resistance to the laws of diffusion and chemical affinity as ordinarily manifested. What I have once before said upon this subject is so to the point here that I may be pardoned for again quoting from a former article.

"The pages of this magazine might be filled in describing the differences which exist between any observed chemical changes and the phenomena exhibited by the simplest particle of living matter. All scientific investigation, instead of narrowing the gulf which separates living from non-living matter, is constantly widening it. The power of chemical change is molecular. The force which determines chemical action or reaction resides in each individual molecule, and the conditions necessary for the exhibition of these forces are, to some extent, under human control. But no chemist has ever 'breathed the breath of life' into a single particle of living matter. None ever will."

Now, while I believe there are more things in heaven and earth than are taught in the materialistic philosophy, yet I do not wish to be understood as urging that my reasoning necessarily implies the existence of *any* super-physical or extra-organic principle. On the contrary, I desire to demonstrate, as I stated at the commencement of this article, that it is possible to prove, on purely scientific grounds, that the changes which take place in a living organism are so different from those which occur outside of it, as to necessitate the existence of widely different conditions. And *this difference in condition is just what we propose to designate by the term vitality*; or, speaking more exactly, *vitality may be said to be the ensemble of all the co-operant conditions under which the changes in matter occur in a living organism.*

Is there any lack of scientific exactness in this use of the term? We need some abstract expression for designating those complex conditions necessary to the manifestation of organic phenomena, and I can think of no more appropriate term for this purpose than that of vitality. There is a vast difference between organic and *organized* forms, and vitality stands as the representative symbol of that special *state* which we call *organization.* This use of the term vitality, while it keeps persistently in view the radical difference between an organization and an organic compound, is at the same time free from all objections which have been brought against its use when interpreted as a principle or entity. When thinking of the phenomena manifested in an organism we may very properly, in our analytical conception, take into account the physical and chemical agencies which form essential components of the act; but at the same time we must recognize that these agencies fall so far short of expressing all that

we witness when the molecular equilibrium of an organism is disturbed, that we use the term vitality for the broader comprehension which it symbolizes.

Neither is there any danger of confounding the meaning of this term with that of life, for by life we mean the special mode of existence of an organism. Vitality may mean the same whether applied to mollusk or man. It stands always as the symbol of the co-operant conditions of the organism which exist at any moment; but between the life or *manifestation* of vitality as exhibited in mollusk and man there is a wide difference. *Life* may be said to be a dynamical expression of the manifestation of an organism, while vitality is the *statical* expression. When we speak of chemical or physical forces or agencies, we speak analytically. When we speak of vitality and life we imply synthesis. The use of the latter is quite as important as the former; and synthesis is after all the last and only true explanation. I do not wish to undervalue the aid derived from analysis, but I recognize that it is at best but a logical artifice, a preparation for that more comprehensive conception which is synthetic. I have, in a previous article, expressed my opinion concerning the undue importance with which analysis has been regarded, and the tendency which this too implicit reliance upon its methods has had in leading to a lack of discrimination of the profound difference between organisms and machines.

I had intended a further elaboration of this subject here, as it very properly follows the question which we have been considering, but the limits of a magazine article make it necessary to reserve this for a future paper.

REFLEX LESIONS OF THE ORAL CAVITY ASSOCIATED WITH PREGNANCY.*

BY JOSEPH RICHARDSON, M.D., TERRE HAUTE, IND.

At a late meeting of the Indiana State Dental Association, it was my privilege to read before that body a paper entitled "Correlated Diseases of the Teeth and Ear." The purpose of the paper was to present some ascertained facts in regard to the reflex nervous relationship between the teeth and the various structures of the auditory apparatus, and to account for the manner in which not only functional but nutritive or trophic diseases of the latter occurred as a sequence of irritation having its source primarily in the teeth or gums.

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* This paper was prepared as a volunteer essay for the late meeting of the American Dental Association.

Researches directed to the ascertainment of sympathetic relationships of other organs, as the eye, brain, stomach, uterus, etc., would probably reveal them also as so many areas correlated in like manner as the ear to primary disorders of the organs of the mouth.

It is not my present purpose, however, to consider further the reflex diseases of organs or regions remote from the mouth, but to reverse the order of inquiry, and trace, if possible, the sympathetic dependency of certain disorders of the teeth upon functional disturbances or structural lesions primarily located in some remote part of the general organism; premising that a better understanding of the laws of reflex action, a more familiar and exact acquaintance with nerve-function, and a clearer insight into the correlated areas existing between widely-separated regions, would lead to more rational and trustworthy views of the etiology of many sympathetic disorders of the buccal cavity, the origin and nature of which are to us as yet measurably a sealed book.

In the discussion of my subject I shall, in order to confine myself within reasonable limits, consider only certain abnormal or pathological states of the oral cavity very frequently associated with pregnancy.

The thought may occur to some that, as utero-gestation is essentially a physiological act, it could not give rise to such irritation as would establish sympathetic affections of the teeth; and this would doubtless be true if the uterine functions were always normally performed. But the simple fact that the reproductive act is, ordinarily, a *conscious* one, leads obviously to the conclusion of functional derangement, for the senses take no cognizance of the normal processes of organic life, and hence no one in perfect health is supposed to have, through the medium of common sensation, any mental perception of a brain, stomach, heart, liver, or uterus. The frequency of oral disorders coincident with pregnancy is, in itself, presumptive evidence of generally perturbed uterine function more or less severe and persistent.

Before proceeding to point out the nervous relationship between the uterus and the oral cavity, it would seem pertinent to examine briefly the generally accepted theory in explanation of certain pathological states of the organs of the mouth associated with gestation. The prevailing view, I believe, is that the more rapid decay of the teeth characterizing this period is due to the increased consumption of lime-salts incident to fetal growth and development, and that this superadded draft upon the calcific elements of the maternal circulation, by diverting the lime-salts from the teeth, impairs the organic integrity of the latter, producing a nutritive lesion characterized by diminished ossific deposits and a correspond-

ing domination of the animal constituents—in other words *softening*, a condition rightly supposed to favor accelerated decay. This theory would seem to be predicated on the assumption that the bone-producing elements supplied by the ingesta are, in the unimpregnated state, largely if not wholly appropriated by the tissues into which they enter as a component,—that there is not, ordinarily, any adequate provision in the way of excess for the demands of a process of Divine ordination, and that when the exigency occurs, it becomes, as between the mother's teeth and the fetus, a simple question of *divide*.

Now, aside from comparatively infrequent cases of tissue-starvation consequent on pronounced deficiency of the bone-producing elements in the food, it would seem but rational to suppose that there is, ordinarily, a *surplus* of the lime-salts in the circulation, adequate for all the contingent needs of both mother and child. If this were not so,—if in the unimpregnated state there were but a simple sufficiency of the lime-salts for the ordinary purposes of growth and repair, in pregnancy, the fetal processes of ossification would suffer in common with the mother's teeth whenever the demand for a largely increased supply occurred. As a necessary result of such imperfect provision of calcific matter during the period of fetal evolution, we should expect to find, in after life, osteological malformations a characteristic inheritance of the human race,—an infirmity by no means common. If this theory of diversion, or robbing Peter to pay Paul, predicated on the assumption of insufficient supply for mother and child is, as I believe it to be, neither rational nor physiological, nor in accordance with any just interpretation of the laws of nutrition, far less is it acceptable as an explanation of other oral phenomena associated with gestation. While it might account for increased sensitiveness of tooth-bone to mechanical or chemical stimuli where decay exists, it is hardly competent to explain the distressing and oftentimes violent pains located in teeth but slightly decayed, or even of unbroken structure, and which are clearly distinguishable from mere hyper-sensitiveness; nor does it in any manner explain the presence of those various neuralgic affections of neighboring parts coincident with impregnation.

We must look further, then, I think, for some more rational solution of the problem of causation as it relates to the oral phenomena coincident with the reproductive processes. A more plausible and defensible theory, I believe, would assign to these phenomena the character of reflex lesions, structural or functional. To justify this conclusion, I shall first endeavor to ascertain if the organs of the mouth constitute an area correlated to the uterus through the medium of the sympathetic system of nerves, and then consider in what

manner the vaso-motor fibers of that system operate as factors in the production of the oral phenomena which I have characterized as reflex lesions. It is important to remember in this connection the essential facts now broadly recognized by modern physiologists, namely, that, with few exceptions, all sensori-motor nerves comprise fibers belonging to the vaso-motor system; that the latter are largely distributed to the blood-vessels; and that their peculiar and distinctive office is to control and regulate the caliber of the vessels to which they are distributed, and consequently the blood-supply to any given part. First, then, do the teeth constitute an area correlated to the uterus through the medium of the sympathetic system of nerves? Such a relationship, I think, is sufficiently obvious, and may be traced as follows: The blood-supply to the teeth is derived from the external carotid artery through its branches, the inferior dental and alveolar branch of the internal maxillary arteries, and the vaso-motor nerves controlling the caliber of these vessels are derived from the external carotid plexus of the sympathetic,—a plexus derived immediately from the superior cervical ganglion. The uterus, its appendages, and the vaginal walls, are supplied with nerves from the pelvic plexus of the sympathetic, which brings these several parts into immediate relation to the spinal sympathetic system. Thus it will be seen that any tissue-impression having its origin in the uterus or associated structures, would be transmitted by way of the afferent vaso-motor fibers to the vaso-motor center in the medulla, and returning by the efferent fibers in reflex relationship with the former, would reach the carotid sympathetic plexus through the superior cervical ganglion. As the branches of the external carotid artery, to which this plexus is distributed, supply the teeth with blood-vessels, it is not difficult, I think, to see how the teeth of the superior and inferior maxillæ become an area correlated to the uterus through the medium of the carotid plexus of the sympathetic system.

Assuming the correctness of this view of the relationship of the regions under consideration, it only remains to ascertain how, through the action of the vaso-motor nerves, nutritive lesions or reflex functional disturbances in connection with the teeth may occur as a sequence of irritation having its source in the gravid uterus, its appendages, or the vaginal walls.

Dr. Charles H. Burnett, in a treatise on the Ear, says: "It may be stated in a general way that *the effect of any irritation in a vaso-motor nerve-tract may be to excite vessel-dilatation through diminished inhibitory nerve-power, in a correlated area.*" Accepting this statement as an ascertained physiological fact, we should have, as the result of any irritation having its source in the uterus or its associated parts, impaired tonicity of the pulp-vessels, manifesting itself in *dilatation*

and consequent congestion or hyperemia. If the disturbance in the pelvic region were such as to produce only slight irritation, the reflex lesion of the pulp would manifest itself as a so-called sympathetic neuralgia consequent on pressure of nerve-fibrils by engorgement and distension of the blood-vessels. These sympathetic neuralgias of the teeth, of either sound or unsound structure, are very commonly associated with pregnancy, and cannot be rationally accounted for, I apprehend, except in the manner here indicated. Ordinarily, the exciting cause would probably be insufficient to induce more than mere functional disturbance in the pulp, but it is easy to see how reflex irritations of sufficient intensity and perseverance might induce blood-stasis, inflammation, and disorganization or death of the pulp.

Now, let us apply the facts and conclusions of this paper in explanation of the phenomena of *softening* and the more rapid decay of the teeth during the period of gestation. The lesion is clearly a reflex one. Anything like habitual hyperemia of the vessels of the pulp must, by altering or diminishing the blood-supply, more or less seriously interfere with the nutritive processes concerned in the reparation of wasting tissues. The consequence of such modification or interference with the normal functions of the pulp, so far as its vessels are concerned in the nutrition of the teeth, would be in the direction of degeneracy or retrograde metamorphosis of tooth-structure. This would imply, we may suppose, defective assimilation of ossific matter for purposes of repair, and certainly diminished vital resistance to the action of agents operative in producing solution of the lime-salts.

We should have, consequently, from the operation of these causes, a tendency to general softening, hyper-sensitiveness, and greatly increased rapidity of decay. These are frequent complications coincident with pregnancy, are always more or less distressing and harmful, and often involve the loss of valuable organs. The subject is therefore one of great interest to us as oral specialists.

The following extract, as having some pertinent relation to the subject-matter discussed in the foregoing paper, is appended to it:

"*Storage and Utilization of Phosphates in Pregnancy.*—In a recent number of the *Union Medicale*, Dr. Delattre discusses a phenomenon of early pregnancy which he considers has not hitherto received the attention which, both on physiological and therapeutical grounds, it deserves. He refers to the almost complete disappearance of the phosphates from the urine. These salts, he says, are, except the small proportion as yet required by the development of the fetus, either stored up in the maternal bones, which increase in weight and

density, or, occasionally, deposited on their surface in the form of osteophytes, which have long been looked upon as errors of nutrition. In the later months, when the fetal bones are growing and ossifying rapidly, these reserves are drawn on, and the osteophytes, if present, disappear. The absorption is not complete at the time when the child is born, but goes on during the normal time of lactation, supplying phosphates to the milk. Such is the course of events in the case of a healthy and well-nourished woman."

THE ILL RESULTS PRODUCED BY THE USE OF ARTIFICIAL DENTURES UPON PLASTIC BASES.

BY WILLIAM H. DORRANCE, D.D.S., ANN ARBOR, MICH.

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(Read before the American Dental Association, August 4, 1882.)

It is a sad and incontrovertible fact, that that disease which comes frequently under the notice of the dentist, known as dental caries, is universally prevalent, and is thought by careful observers to be on the increase. The loss of teeth resulting from other causes, particularly calculus in its various forms, is also appalling.

Though much painstaking effort on the part of members of the profession has been directed to the diffusing of practical information relative to the proper care of the teeth and the pressing need of their salvation, much more has been said and done that is not only fallacious and harmful, but, in view of the high importance of each member of the oral apparatus to the human economy, absolutely (though perhaps ignorantly) criminal. That the public at large, even highly intelligent and cultivated portions of it, are apathetically lacking in appreciative knowledge of the important functions of the teeth, and consequently more indifferent to their loss or efficient restoration, is not surprising, when it is taken into consideration that the great majority of those who, by reason of their claim of membership in the dental profession, should know, are yet to become properly educated in the matter.

While the representative portion of the profession has been steadily advancing in the treatment of diseased conditions and in a knowledge of therapeutics, and may be said to be making headway in oral surgery; while it is becoming—nay, has become—justly noted for superior excellence in all operations upon the natural teeth, it has not made corresponding advancement, but has rather retrograded in the equally important department of dental prosthetics.

The reputation of a person is determined by his acts, and that of a profession is established by the abilities and activities of its members.

In the rapid stride of those who are (by the process of "natural selection") placing themselves in the front as operative specialists, and of those whose love for the work has led them to devote themselves to the investigation of proximate causes, there has been, it is to be greatly regretted, a dropping out of any thought or care for the prosthetic part of the work, with a consequent debasement of it, and desire of divorcement from it. On the other hand, the short-sighted and time-serving indifference with which assistants have been chosen, or so-called students admitted to the offices of reputable practitioners, and without subsequent preparation or direction of moment, and with scarcely a glance at a text-book during the few short months of their stay, have been carelessly allowed to launch out as members of the profession (and come to be recognized as such by the too indifferent and pre-occupied public), has been the means of bringing to the ranks of the profession the men who, as numbers go, constitute the bulk of it, and into whose hands prosthetic dentistry has been largely allowed to fall. These, in the exigencies of the matter, have no thought or care for the advancement of the profession, or the amelioration of the condition of suffering humanity, save as it is to the present interest of their pockets. And hence we have a profession that, whatever its claims to advanced standing, has in its representative membership been gradually losing sight of, or, perhaps, rather has lost interest in observing and investigating not only the mechanical, but also the physiological and esthetic principles involved in the construction of an artificial denture, which shall as perfectly meet the requirements as it is possible for human skill to provide, and consequently has neither the skill nor the judgment to properly advise patients in the matter.

But there are other causes for failure of advancement in dental prosthetics. With the introduction of plastic (or vegetable) bases for the support of artificial dentures came a new era. People who were previously unable on the score of expense to have lost organs replaced, and those who valued absence of pain rather than the presence of natural teeth, began to think that they too might have artificial substitutes, and thousands of such have been supplied with plastic plates.

Dentists who had been in the habit of putting much skill into the construction and fitting of gold and other metallic plates allowed the ease of manipulation which was soon acquired, and the lowness of cost of rubber work to mislead them into what has proved the error of recommending it to their trusting patients as the best for them. That same fatal ease not only led to vastly inferior work, but to the indiscriminate and greater loss of valuable natural teeth, millions of which are now annually sacrificed to be replaced with teeth

upon plastic bases. One of the results of this growing evil is that the great majority of those whose increasing reputation for professional skill should have made them especially solicitous to give their patients the best of advice and service, have gradually been relegating this important part of their duty to the inefficient care of those whose only apparent claim to be called dentists is that they can make rubber or celluloid plates.

It is true there are those whose best efforts have been and are devoted to elevating prosthetic dentistry, and their names are shining marks, but quite like angels' visits.

As a natural sequence of this apathy in regard to, and manifest desire to get away from prosthetic dentistry, on the part of the bulk of what is termed the representative part of the profession, it has been heavily handicapped in its strife for higher life and position by dragging the dead-weight of those whose best efforts only serve to degrade an honorable profession to a plane below that of a reputable trade, abundant proof of which is seen in the efforts of what is to-day known as "cheap" dentistry.

Having noticed thus briefly what the introduction of plastic work has done for the profession, let us consider if there is anything in the use or abuse of these bases having bearing upon our duties to our patients as conservators of their health and physical well-being.

The qualities which principally have brought rubber and celluloid into such general and almost exclusive use may be very briefly stated: Rubber is easy of manipulation and cheap. Celluloid is inferior to rubber in these respects, but has the fickle superiority of better color. The first quality has made it possible for the veriest tyro (whose name is legion) to make what can only by an extreme stretch of courtesy be called a set of teeth. The second has made possible to thousands (whose sore need did not by any means give them the knowledge on which to base sound judgment) the possession of an inferior substitute for the priceless natural organs now lost. Let us see if this multitude have been defrauded and injured in this attempt to aid them, and first briefly name the structures involved in the support of an artificial denture. In the endentulous mouth we have the superior and inferior maxillary bones, with their alveolar processes and foramens of exit for important nerves and vessels, their places of insertion for the muscles of mastication and expression, and their investiture of soft tissues with their ducts and glands; the mucous membrane with its delicate glands. That important fluid, the saliva, with so much depending upon the healthy condition of its components, and, where there are still left some of the natural teeth, their susceptible structure and attachments must be taken into account.

We must inquire into the uses of the organs we seek to replace,

not pausing to admire the infinite skill and wisdom manifested in the arrangement of the perfect set of natural teeth; into mastication, noting the necessity of the grinding action to the excitation of the parotid glands; insalivation, only well accomplished when the food is thoroughly masticated; vocalization or articulation—no part of the vocal apparatus being more essential to the distinct utterance of speech; we must notice the regulatory effect of a full denture upon the respiration; and also the support of the contour of the face by the teeth and their investing processes, and the important relation of the teeth to the physiognomy.

What are the principal changes that take place as the result of the loss of teeth? If that loss is partial, there is a corresponding loss of grinding and occluding surface, the magic arch is broken, and the teeth left, having lost the support of their fellows, soon change position, and a perfect occlusion is destroyed; ease and distinctness of enunciation are seriously impaired; the absorption of the alveolus allows a corresponding sinking of the face.

Having thus briefly glanced at the principal structures and functions involved, let us see what the effect of introducing a prosthesis on a plastic base will be. Leaving aside the mechanical irritation due to illy-fitted plates with the common deep chamber and ordnance map of ridges, and with the assertion that it may be considered an axiom that under like conditions it is impossible to secure as perfect a fit with a plastic or a cast plate, as with a swaged plate (inasmuch as the perfectly shaped plaster model does not represent the varying texture of the mouth), let us at once consider another very serious objection to plastic bases,—that due to non-conduction. It being an essential condition of health that the heat constantly generated in the body shall pass away from its surface, its complete retention must result in death, and partial retention induce a greater or less pathological change of the part or surface involved. As the mouth is used for the reception of food and for speech, so far as thermal change is concerned it must be considered a heat-liberating surface. With the use of a vegetable plate comes a pathological condition due to non-conduction. The surface covered becomes congested, and the mucous membrane puffs up as though it were blistered; there is paralysis of the nervous supply. The mucus assumes an acid reaction, and the mucosine is coagulated and is a source of further irritation, and there is an abnormal rapidity of absorption of the alveolar process and the bone. Where natural teeth are present they soon become unhealthy and sensitive, and in spite of the utmost care the surrounding gums lose their integrity, and gradually the teeth go. The vitiated condition of the secretions soon becomes noticeable by the peculiar odor, and the plate becomes coated, and

even with constant care it cannot be kept in a bearable condition.

In 211 partial and full cases observed, where upper plates upon plastic bases were worn, 165 of which were rubber and 46 celluloid, 47 per cent. have shown these effects in an aggravated form. In 91 per cent. these effects were marked, and in the remaining 9 per cent. there was no noticeable ill result. In three cases there was marked necrosis of bone, with sloughing of tissue. By estimation (as there was a failure to keep a complete record) the average time of use was two and two-thirds years. It is true that in many cases there was the complication of mechanical irritation due to the outrageous means used to secure retention of the dentures. In the observation of something over fifty lower cases (of the same patients), while some of the effects produced by the upper plates have not been quite so marked, a careful comparison with cases where metal or no plates at all were worn, has led to the belief that one marked effect has been the same, viz., greatly increased absorption. In many of these observed cases the congested condition extended beyond the borders of the denture to the throat, and was doubtless complicated with general pathological conditions.

Now, without going into a statement of the difficulties in the way —nay, impossibilities—of accomplishment of esthetical results with rubber, or the short life of the same results as apparently secured by celluloid, and without discussing the inherent tendency to uncleanliness, let us ask if the same effects are found as the result of the use of dentures based upon some conducting material. Of the 211 cases before noted, 126 have been replaced with metallic plates after such treatment as might be available. Of this number of cases enough have been under observation to give a fair estimate of the value of the change, and the least that may be said is that the improvement is marked. In many of them the return to health has produced such a shrinkage of the mucous membrane and the gums as to necessitate the refitting of the case in a few months' time. In all cases the patient has expressed a greater or less degree of appreciation of and gratification for the pleasant change.

These observations, showing the necessity of conduction, so far as they go, prove that vegetable bases are injurious and should not be used, and bring us squarely to face the fact that if we would do justice to those of our patients who are in need of artificial substitutes, we must see that they are intelligently supplied with such as will do them the least injury and secure the best results; and the profession certainly places itself in a very bad light before its own conscience, if it refuses to take cognizance of that branch of its activities which clearly cannot with any show of justice or shadow of excuse be cut away from its perfect whole without seriously crippling its integrity.

PROCEEDINGS OF DENTAL SOCIETIES.

AMERICAN DENTAL SOCIETY OF EUROPE.

The tenth annual meeting of the American Dental Society of Europe was held at the Hôtel d'Allemagne, Ostende, beginning August 7, 1882.

Dr. W. St. George Elliott, president, in the chair.

The president read the following address:

Another year has passed away since we last met together,—a year of changes more or less important to us all; we are a year older, and let us hope we have made some progress in that professional life which is so dear to us. Since our last reunion at Wiesbaden, just after the meeting of the International Medical Congress, many societies have held their monthly gatherings, many papers have been read and discussed. Nothing particularly new or startling has been brought forward, however, although we have been given much material for thought and experiment, particularly in the admirable papers by Drs. Abbott, Bödecker, and Heitzmann, published in the Dental Cosmos.

Dr. Talbot, of Chicago, in a paper read before the Illinois State Dental Society in May, 1881, brings forward many experiments to prove the use of amalgam objectionable; they all tend to confirm what is perhaps an accepted fact, the vaporization of mercury at the temperature of the mouth. The experiments as recorded in Dr. Talbot's paper show that this vapor is not only given off at a lower temperature than 100°, but that this vaporization continues indefinitely, an old amalgam filling that had been sixteen years in the mouth answering to the test for mercury. That this vapor may to some extent be injurious to animal and vegetable life, is shown by the fatal effects upon small insects when fastened up in bottles containing old fillings. We must not be misled by these experiments; for, while I am quite willing to abandon amalgam where it is proved to be injurious, I would like to see some positive proof, and I cannot look upon the thirteen experiments of Dr. Talbot as conclusive. No scientific man could accept data so limited, or reasoning so unsound.

Now, how much mercury is there in a large amalgam filling? Say some 5 grains. Suppose, for argument's sake, we say an individual has ten such fillings; he will have sealed up in his teeth 50 grains of mercury, or ten doses of calomel. What physiological effect could that amount of mercury have, locked up as it is by crystallization? It would be almost *nil*, and would be eliminated from the system in a few days. What potency can there be in a vapor given off for

sixteen years, when the original amount of 50 grains, if in the form of calomel could produce so slight an effect.

A very interesting paper was read by Dr. N. W. Kingsley, of New York, at the International Medical Congress, on the effect of civilization upon the teeth. In this paper he took up the several professional theories on the subject, examined them in detail, and discarded those which he considered could not stand the test of investigation; but, while the doctor pointed out what may to some extent be accepted as the truth on the subject, some of his opinions were not altogether sound. The physical theory of food—that is, whether it is hard or soft—which is to some extent advocated by the profession, certainly has much to favor it; so much indeed, that, given a certain kind of diet, one may look to some extent for a corresponding condition of the teeth, as a consequence. If the food is hard, one may expect to find them clean and healthy. This is the case, so far as I am aware, with all aboriginal tribes; they use hard food, dried beef, etc., and gnaw bones. Now I do not state that the soft character of the food shows itself in caries directly; but I do say that, where the food is hard, the teeth are in consequence cleaned by mastication, while with those nations who use soft food we find tartar, mucus, and food between the teeth, and secondarily caries. I had the best proof of this in examining the teeth of Japanese, Chinese, and Indians, during a six years' sojourn in the far East. According to my experience, none of the Eastern nations clean their teeth; some, indeed, make a show of cleanliness, but this is confined to the more conspicuous parts of the mouth; in fact, the stick used as a substitute for the brush is incapable of getting at the more inaccessible portions. As the food of these Eastern people consists chiefly of rice and other soft materials, and as neither nature nor art keeps the teeth clean, we have as a result a large accumulation of tartar, with the early removal of teeth by Riggs's disease. Nor are these people at all free from caries; as far as my observation went, the disease was almost as frequent as with us. It is only necessary to mention the fact, that the kind of food has much to do with the cleanliness and consequently the durability of these organs, because we all know from daily observation how easy it is to tell which side of the mouth the patient uses by its greater cleanliness; not only is this so of those who do not thoroughly clean their teeth, but, in a case where the very best attention is paid to them, one can tell at a glance if both sides are not used equally. Dr. Kingsley states in his paper that the blubber-eating Esquimaux, the Oriental rice-eater, and the savage of the forest, have all good teeth; had he stated that all wild tribes (the Eastern nations cannot be so called) have good teeth, he would have been nearer the mark. I might add

here, that I quite agree with the doctor, that civilization *per se* is not conducive to caries. The worst teeth are found among the South Americans, notably the Peruvians, the Chilians, and perhaps among the natives of some of the cantons of Switzerland. I have examined many of the huacas or tombs of the mummies of the time of the Incas of Peru, without discovering any marked traces of caries, but in the mouths of modern Peruvians, Chilians, and Brazilians, it is most common. I have examined the skulls in the interesting old crypt at Hythe, Kent, England, which are supposed to be those of early Danes,—more likely those of Britons,—and have noticed how seldom caries is met with there; but these people of ancient times were primitive, lived an out-door life, used hard food, and were physically more vigorous than their descendants of to-day.

Dr. Kingsley does not accept the brown-bread theory, and yet brown-bread can do much for the teeth. Perhaps the Scotch might be said to have fairly good teeth; I say fairly, because I know they suffer much with these organs as well as other people; but I think we may correctly say that the Scotch have better teeth than the English, and oatmeal and coarse, hard food are common in Scotland. Observation nearer home has tended to confirm these theories. One of my children was brought up on condensed milk until he was four years of age, when I found that his deciduous teeth had nearly all become carious, the crowns of the temporary molars being almost wasted away. I put the boy on an oatmeal diet, the decay ceased and made no progress to speak of afterwards; this is now some eight years ago, and at the present time he retains some of his temporary teeth.

No doubt Dr. Kingsley is correct in attributing caries largely to the mental strain the present age seems to demand, but I do not think it has been proved that this exists most extensively in America. I have carefully looked into the matter, and the conclusion at which I have arrived is that the Americans have physically deteriorated from the parent stock. It may be admitted, though not proved to be a fact, that the teeth of Americans are worse than those of their English forefathers; yet, if so, they have more than equaled matters by the greater care they bestow upon these organs. My experience in conducting a large London practice is that not 10 per cent. of my patients—from the nobility downward—know how to clean their teeth, and 75 per cent. suffer a modified form of Riggs's disease, affecting mainly the lingual border, and this from want of cleanliness. Why is it that the profession in England has not made that practical progress that we might expect? We do not have to look far for an answer. I do not believe that the ability to do practical work is at all a question of nationality; it is one largely of

circumstances. In America no one thinks of employing exclusively an American; there all nationalities fare alike, all have to come up to the expected standard, or suffer the consequences, in a limited practice. The demands of the people are met by the skill of the profession. It is the same everywhere—given a demand, and a supply will follow. Now, in England the mode of life differs from that in America; instead of living in towns nine months of the year, and spending three months or so at watering-places, as is common in America, most of the best people live for nine months at their country-seats—remote, perhaps, from any respectable dentist, and but three months or so of a season are spent in London, or some other fashionable resort. Again, in my wanderings over the world, I found the English everywhere. My practice in Japan was mostly among English people, I have found the same true of all South America, Australia, and India—at least four English to one of any other nationality. In many places there are no dentists, and it is owing largely to these circumstances that they have not been taught to bestow that care upon their teeth that they should. There are in Great Britain and Ireland 5341 dentists; of these there are 698 with qualifications, and probably some 2000 fairly qualified, leaving a balance of some 2500 odd who are presumably chemists or druggists. Tell me the ratio of dentists to the population, and I will tell you the care given to the teeth—in England, say 2700 to 35,000,000, while in America there are some 10,000, to 50,000,000,

A paper of some interest was read by Mr. C. W. Dana before a society of Florence, bearing on the same subject. He drew up a series of questions, sent them to medical practitioners throughout Italy, and received some forty-four answers. The questions partook of queries as to the extent or frequency with which caries is met with, the physical character of the people of the section, the nature of their food, drink, and the use of tobacco. Of these forty-four answers 50 per cent. replied that caries was common, 14 per cent. that there was but little, and only 4 per cent. that the teeth were good. Of course, nothing can be made of statistics so meager, the indications simply proving that the teeth suffered with other organs when the individual was subject to adverse influences, either of climate, employment, or food. Again, these answers are given by physicians, who, not having their attention called to these organs except for the purpose of extraction, are but indifferent judges of either the frequency or the character of dental disease.

In England the profession is making marked advances, new societies are being formed, and practical men are largely on the increase. There is, however, an obstacle to improvement which may have an unlooked-for effect. Some years ago a dental bill was passed through

Parliament, obliging all dentists to register, and prohibiting any new registrations except through certain examining boards in Great Britain, and the graduates of two American dental colleges, Harvard and Ann Arbor. The result of this legislation will be that not enough registrations will occur in the next ten years to supply the natural loss by death in the profession; consequently we look for a sort of dental famine.

And now, Gentlemen, I have finished. You will kindly pardon the liberty I have taken in presenting you with an address of a mixed character, but the opportunity was too good to be lost.

The following officers were elected for the ensuing year: Dr. W. St. George Elliott, London, president; Dr. Benjamin Cohen, Hamburg, vice-president; Dr. W. D. Miller, Berlin, secretary; Dr. William Patton, Cologne, treasurer.

The secretary read an article from Dr. Wright, of Cincinnati. Dr. Wright evidently belongs to a class of dentists who may be styled Electivists, and selects from the numerous filling-materials at present in use, the one which he considers best adapted to the case in hand, believing that the dentist should be complete master of the situation, and should neither submit to the whims of his patients or to public opinion, nor allow himself to be influenced by anything which any brother dentist, who may chance to see the operation at any future time, might say about it. In his attempt to conserve the human teeth without deformity, Dr. Wright is as averse to tacking gold blocks on to a delicate reticulum of living matter, as he is to the building out of gold in prominent places for the purpose of display.

A paper on "Resection and Cicatrization of the Dental Pulp," by Dr. De Trey, of Vevay, was also read by the secretary. Dr. De Trey's operation consists in removing the softened dentine *around* the point of exposure by means of very sharp hoe-shaped excavators, the dentine immediately upon the diseased part of the pulp being left in the form of a little hill; this hill of decayed dentine, together with the underlying pulp-tissue, is then removed with one sharp stroke of the instrument, great care is taken to allow the pulp to completely disgorge itself of blood, and to prevent the blood from coagulating within the cavity by rinsing with warm distilled water. After the bleeding has entirely ceased, a filling of oxyphosphate is introduced directly upon the pulp. No applications of any kind are made to the pulp before filling.

Dr. Patton. A method similar to the one described and advocated in the paper was, I think, employed by Witzel and described by him in the Central-Verein der Deütschen Zahnärtze, and in the Viertel-jahrsschrift some two years ago.

Dr. Miller. Dr. Witzel has been in the habit of cauterizing diseased pulps with arsenic, removing the part so cauterized some hours afterwards and filling over the remains. He says that such cases examined years afterwards have shown the pulp in a state of perfect health. This process was considerably discussed a year or two ago, found some followers, and reported some successes. I do not think, however, that it has been practiced to any extent, certainly not in America, the impression being that any attempt to save a pulp to which arsenic has been applied must be futile. Dr. De Trey's operation is entirely different from anything yet brought forward, in that it avoids the use of every escharotic disinfectant or antiseptic, except in so far as the filling-material, oxyphosphate, itself possesses these properties; the idea, no doubt, being that the deposit of osteo-dentine will be more likely to follow the operation when the delicate pulp-tissue has not been subjected to such rough treatment as a bath of pure carbolic acid, chloride of zinc, arsenic, etc.

One of the most important features of Dr. De Trey's method is the scrupulous care with which he completely stills all bleeding from the pulp before introducing the filling, a precaution which is now recognized as being of the utmost importance in the treatment of all wounds.

Dr. Cunningham. I have always looked upon arsenious acid as a very dangerous material in the hands of the dentist, and have, therefore, systematically avoided its use, unless the object was complete extermination of the pulp. I should like to hear the views of the gentlemen present upon this question, and if any good is to be derived from a proper use of arsenious acid I should like my patients to have the benefit of it.

Dr. Cohen. I sometimes apply arsenious acid, with a proper amount of caution, to the necks of teeth, especially where such teeth are required to support artificial dentures and have become too sensitive to bear the contact of the clasp. I have in this way succeeded in obtaining relief for the patient without any apparent injury whatever to the tooth.

Dr. Bogue. At one time I came in charge of the practice of a dentist who made extensive use of arsenious acid for obtunding sensitive dentine. I cannot say that it had any effect upon the pulp of the tooth, but I met with numerous cases where the teeth, especially the front teeth, had become perfectly blue and were ruined forever so far as appearance was concerned.

Dr. Miller. According to the statement of Dr. Bogue, we are led to infer that the pulps were not injured by the application of arsenic in the cases which came under his observation. Permit me to say,

however, that a pulp which has gone through such a stage of inflammation that the dentinal tubules become infiltrated with the coloring-matter of the blood, will, in my opinion, never be able to return to a healthy condition.

Dr. Bogue. In one case I bored into the tooth and found the pulp alive.

Dr. Miller. I venture to say that the doctor would not find the same condition in more than one case out of a thousand.

Dr. Patton. During thirteen years I have used equal parts of acetate of morphia and arsenious acid for obtunding sensitive dentine, in cases where the decay has not approached too near the pulp, and have never seen any harm to the tooth resulting from such treatment, even when the application was allowed to remain in the cavity six or eight hours.

Dr. Miller. We know that arsenious acid may be applied to an inflamed pulp without being absorbed sufficiently to produce its death; for a similar reason the same application might possibly be made with impunity to inflamed dentine, while healthy dentine would be seriously injured by it. I have always been taught that it is bad practice to apply arsenic to any of the tissues of the tooth unless it is designed to destroy the vitality of the same.

Dr. C. V. Du Bouchet, of Paris, exhibited to the society Paquelin's thermo-cautery and the galvano-cautery, with their application to dentistry. In Paquelin's thermo-cautery advantage is taken of the power that platinum has of condensing large volumes of gas upon its surface. Into a hollow platinum point heated to dull redness in the flame of a spirit-lamp is forced the vapor of naptha in small quantities, while air is admitted through small holes in the base of the point. The platinum becomes immediately incandescent at the point where the air and vapor come in contact, and the incandescence spreads at once to the whole mass of the platinum point.

The advantages of this cautery are set forth as follows:

1. The heat of the instrument is permanent.

2. The operator may raise the heat to the desired degree in a few seconds, and maintain it at this point as long as necessary, or lower the temperature instantly.

3. It may be passed through liquids and organic tissues without being extinguished.

4. Very little heat, relatively, is reflected from the cauterizing point.

5. By reason of the many forms into which the cauterizing points may be manufactured, all the demands of surgery are efficiently supplied.

6. It operates with great regularity.
7. It is very easy to manage, and takes up but small space.
8. The combustible element may be procured anywhere.
9. The expense incident to the use of this instrument is very slight.

The society manifested much interest in this instrument. In connection with the galvano-cautery, Dr. Du Bouchet exhibited a great variety of platinum points, made of fine wire and adapted to various cases in practice. The galvano-cautery is claimed to be especially efficient (1) for producing complete cauterization of the dental pulp; (2) for obtunding sensitive dentine; (3) for application to the gum in periostitis, spongy gums, and Riggs's disease; (4) for opening abscesses, cysts, excision of sarcoma, epulis, etc.; (5) for arresting hemorrhage, etc.

Dr. George Fay. What advantage does Paquelin's cautery possess over such agents as nitrate of silver, etc.?

Dr. Du Bouchet. It acts much more promptly and thoroughly and produces a wound which heals more rapidly.

Dr. Miller. Do you not have much difficulty in persuading your patients to allow you to make use of this instrument?

Dr. Du Bouchet. Very little. When the instrument is at a white heat, inflamed, puffy gums melt away with scarcely any pain to the patient.

Dr. Bogue. What advantages are claimed for the form of battery which you have just exhibited?

Dr. Du Bouchet. It is said to retain its electrical force longer than any other of the piles of similar construction. About 120 cauterizations may be performed with one liter of the bichromate preparation, and it is only necessary to clean the pile once in five or six months.

Dr. Elliott. I have for some time been making use of the Leclanche cell. The battery consists of twenty small cells, which are contained in a box. Only ten cells are in use at a time. After the first ten have served awhile, the other ten are taken and the former left to recuperate. Ten cells will run for six months without the slightest attention, and the current remains perfectly constant throughout the longest operation. (Made by Coxeter in London.)

Dr. Jenkins. The celebrated instrument-maker, Josef Leiter, of Vienna, has been experimenting successfully with a battery, which I understand to be of American origin. Instead of zinc, *thin* platinum plates are used. One side of these plates is united to *thick* copper-plates, and these are said to be covered with lead or some other substance not acted upon by the bichromate. The heat evolved from the platinum plates is thus conducted away from them to the copper-plates, so that a constant battery is then formed

as there is no polarization of the carbons. So the new battery has been explained to me, but I have not seen it in operation, and cannot vouch from personal experience if the difficulties in the way of making a constant battery with bichromate have thus been completely overcome.

Dr. Elliott read a paper on "System, as Applied to Instruments and Books."

Dr. Sachs, of Breslau, read a paper on "Iodoform." Having read the glowing accounts of the wonders accomplished by dentists with this material in the treatment of pulpitis, periodontitis, alveolar abscess, and all the ills that teeth are heir to, Dr. Sachs endeavored in a great number of cases to obtain the same results, but without the same success, and as the result of careful and prolonged experiments with the material, he came to the conclusion that iodoform as a dental remedy was inferior to a great many now in use.

Dr. Perkins. I also was led to use iodoform for the same reason given by Dr. Sachs. I came near losing a tooth by it, and then gave it up.

Dr. Cunningham. I must say that I have not experienced the difficulties mentioned by the gentlemen. I make use of iodoform and eucalyptus oil together with very good effects, for both pulpitis and alveolar abscess.

Dr. Perkins. May not the good result be attributed to the eucalyptus oil?

Dr. Cunningham. That I cannot say.

Dr. Miller. When iodoform was first introduced into general surgery, it was hailed from all sides with such a storm of praise, that a number of the dental profession, under the impression that the remedy must be equally good in dental surgery, began at once experimenting with it, and in the general tendency to find nothing but good in iodoform, I think, greatly overrated its beneficial powers. What appeared to make iodoform so valuable a remedy in general surgery is the fact that it possesses marked antiseptic properties without having the strong escharotic effects of carbolic acid. But in dentistry it loses this advantage, for here, in many cases, an escharotic property is of no disadvantage, and in other cases it is absolutely necessary.

The secretary read a paper from Dr. Galbreath, of Dresden, on "Some Difficulties in the Manipulation of Celluloid." Dr. Galbreath gave the result of a series of experiments which he had made with the Heindsmann apparatus. Out of twelve attempts made with the greatest care, and in exact conformity with the directions accompanying the apparatus, only one resulted successfully; the others, ten of which related to one case, resulted in the most various dis-

asters, such as breaking the teeth, breaking the model, pressing the plate out of shape, burning the plate, etc. Dr. Galbreath came to the conclusion that he at least could not work celluloid in this way. He has begun experimenting with Dr. Campbell's New-Mode Heater, which promises to give better results.

Dr. Miller read a paper on "The Action of Micro-organisms in the Decay of the Human Teeth." The results at which he arrived were the following:

1. Acids (principally those generated in the mouth by fermentation), produce the decalcification of the tissue of the tooth.

2. The decalcified tissue is invaded by enormous masses of fungi (Spaltpilze).

3. Leptothrix threads are, with few exceptions, found only on the surface or in the superficial layers, bacilli penetrate further and micrococci furthest, frequently to a depth of 2 mm. or more.

4. The fungi (bacilli, micrococci, etc.) are different stages of development of the fungus leptothrix.

5. In the separate tubules a gradual transformation of leptothrix threads into long bacilli, of long into short bacilli, and of short bacilli into micrococci, may frequently be observed.

6. The invasion of the fungus is always preceded by the action of an acid or acids.

7. The leptothrix has not in any of its forms of development (bacilli, micrococci, etc.) the power of decalcifying tooth-substance, nor can it penetrate the sound tissue, so that the actual *infection* of a perfectly sound tooth by a carious tooth is an impossibility.

8. On the other hand the leptothrix aids in producing the decomposition of the external layers, and causes pathological changes in the deeper, still living tissue.

9. Neither pulpitis, periodontitis, nor alveolar abscess can, in the opinion of Dr. Miller, be ascribed to the action of micro-organisms.

10. The fungus saccharomyces mycoderma is the only organism so far known which, beyond all doubt, has the power of penetrating perfectly sound dentine or enamel.

These papers were not discussed, through lack of time.

Dr. Cohen demonstrated his method of utilizing small pieces of rubber dam. A number of rectangular wire frames made to fit the different parts of the dental arch are kept on hand; over these the rubber is stretched and the application to the teeth made as usual. Patients who cannot bear the rubber dam as ordinarily applied are very thankful for this little contrivance.

Dr. Bogue explained Dr. Büttner's method of pivoting. Dr. Büttner's method is probably too well known to need a full description here. It consists essentially in making the end of the

root, for a short distance under the margin of the gums, perfectly round, and fitting, with "mathematical precision," a cap over the rounded part, the attachment being at the same time made more secure by means of a pivot passing into the canal of the root.

Dr. Jenkins. Would it be possible to apply this system to roots which are split or fractured, or for any other reason not perfectly sound?

Dr. Bogue. Dr. Büttner's method is exactly adapted to such cases, the gold cap binding the parts of the root firmly together.

Dr. Kingsley. Suppose the root is split from the margin of the gum diagonally for about one-quarter to one-half an inch up the side, as it frequently happens, and the smaller piece gone.

Dr. Bogue. The missing part can be restored with amalgam and the operation completed as though the root were perfectly sound.

Dr. Patton. Building an amalgam filling on the side of a root is an operation which is more easily talked of than done, and I doubt if such an operation could be made to be lasting.

Dr. Crane. I should like to ask Dr. Bogue how this manner of setting pivot teeth applies to roots of bicuspids?

Dr. Patton. Or to oval incisor roots?

Dr. Kingsley. Or lower incisors?

Dr. Bogue. The root is made round by means of the instrument designed by Dr. Büttner, though I do not believe that the operation is intended to be applied to bicuspids.

Dr. Perkins. What becomes of the shoulder made on the root, and does it not produce irritation of the gums?

Dr. Bogue. It is supposed that it will be absorbed; in practice the gums appear perfectly healthy after such operations.

Dr. Patton. It seems to me that Dr. Büttner's method is a little too heroic; many patients would rather go without a tooth than suffer the pain incident to paring off the pericementum and cementum around the neck of the root, while a tooth once so treated is necessarily very much weakened. I make use of a Bonwill crown, which I set in the following manner: I set a coarse platinum screw into the root without tapping. This holds perfectly tight—so tight, in fact, that the root may be removed by means of the pin. The pin may then be bent to suit the direction which the tooth is to take. The crown is then adjusted to the root without taking any pains to get a perfect joint. Then the end of the root is covered with amalgam, and the opening at the base of the crown also filled with amalgam, and the crown pressed or driven into place. The end of the pin is then split and riveted by means of a chisel, covered with amalgam, and the operation is then finished.

Dr. Patton also described his method of filling large crown cavities

with cement, covering the surface of the cement, excepting the border, with gold-plate, and then filling around the margin of the plate with foil, making a very perfect and durable operation.

Dr. Jenkins. I should like to ask Dr. Kingsley what he thinks of the combination of tin and gold as a filling-material.

Dr. Kingsley. On the recommendation of Drs. Abbott and Jenkins, I have made a number of experiments with the combination of tin and gold ordinarily used. I have used it very extensively, and still use it for all large compound cavities, filling the cavity about one-third full, beginning at the cervical wall, and completing with gold. I generally commence with gold from retaining points near the grinding surface, though one can easily build directly upon the tin and gold. This combination adapts itself very easily to the walls of the tooth, and can be worked with great rapidity; one who has not used it, can hardly understand the ease with which such a filling may be inserted. I feel very much indebted to Dr Abbott, who introduced this method of filling teeth, and to Dr. Jenkins, who persuaded me to adopt it.

Dr. Du Bouchet. How are the particles of gold distributed in the filling?

Dr. Miller. A strip of non-cohesive gold foil is placed upon a similar strip of tin foil. These are then rolled together, sometimes the tin and sometimes the gold outside. Sometimes the rolls are striped like a barber's pole. It makes no difference which is on the outside, and it follows from this manner of preparation, that the particles of tin and gold will be tolerably equally distributed throughout the mass of the filling.

Dr. Jenkins. It is now some sixteen years since this manner of combining tin and gold was introduced to the profession by Dr. Abbott, and it has proved itself to be a most valuable agent for preserving the human teeth. A friend of mine has a filling made sixteen years ago by Dr. Abbott, with the intention of replacing it with gold after three months. It remains there to-day, in every respect as good as when it was inserted. I need not repeat what I have so often said before this society with regard to the wonderful ease with which tin and gold fillings can be made. I will only say that those who do not use it deny themselves and their patients a great boon. A filling which has been in the mouth for some months will be found to have somewhat expanded and to have undergone other molecular changes, the tin and gold becoming, as it were, amalgamated, and forming a perfectly homogeneous mass.

Incidents of Office Practice.

Dr. Crane, of Paris, brought before the society the case of a lady

suffering for twelve years from severe pain in the region of the inferior maxillary branch of trigeminus. Every possible means had been tried; section and resection had been performed a number of times, with only very temporary relief. What was to be done?

Dr. Patton suggested nerve-stretching. It remains, however, to be seen whether or not this operation, if performed, will meet with more success than previous ones.

Dr. Bishop. A short time ago a young lady called upon me to have a root pivoted. It was very loose, and broken off deep under the gum. I told her I did not believe that I could set a tooth on the root, but she insisted that an American could do anything, so I concluded I must try. The root being a first bicuspid, I opened up both canals, or what remained of them, and set a thin wire into each canal. The projecting ends of the wires I bent together so as to form a staple. I then built Hill's stopping around and under the staple: fitted a plate-tooth in place and carried the Hill's stopping down over the pins in the tooth; removed the tooth and staple together, substituted caoutchouc for Hill's stopping, and vulcanized. The tooth has been in place for six months and is doing perfectly well.

Dr. Jenkins. Such cases as that just explained by Dr. Bishop show us what may be accomplished with good-will, patience, and skill combined. There is at present no necessity for the intelligent dentist to extract roots. Everything which can be made to furnish anchorage for a pin or screw, for supporting a crown, should be preserved and made use of to avert the terrible misfortune of having to wear an artificial denture. A single root with a pivot firmly anchored in it may be made to furnish support to a whole row of teeth with only a pin passing into a cavity in a tooth at the other end of the row and a small gold plate resting upon the alveolar ridge.

Dr. Cunningham. I think Dr. Jenkins somewhat exaggerates the misfortune of having to wear an artificial denture, as well as the advantage of the permanent gold plates which he inserts. We all know the state of the gums and roof of the mouth under a plate which is not daily removed for cleansing. What, therefore, must be the condition of the ridge under the plate which can never be removed, while particles of food are continually making their way under it where they remain to decompose?

Dr. Jenkins. The plate which supports the teeth, extending from one point of anchorage to another is so small, and the part which touches the ridge so narrow, that absolute cleanliness is insured. In this way a lateral incisor has been made to support a row of teeth back to the first molar. A square pin or horn is firmly anchored

in one tooth or root and a round horn admitting of motion into the other. I do not at all hesitate to devitalize the pulp of a perfectly sound tooth in order to furnish support for such a contrivance, rather than submit the patient to the discomforts of a large plate covering the roof of the mouth.

The society passed a vote of thanks to Dr. W. C. Barrett, of Buffalo, for a number of very interesting microscopical preparations, plaster casts, etc., kindly loaned by him to the secretary for demonstration.

The society adjourned to meet at Cologne on the first Tuesday in August, 1883.

W. D. Miller, *Secretary.*

AMERICAN DENTAL ASSOCIATION—TWENTY-SECOND ANNUAL SESSION.

Fourth Day.—*Morning Session.*

The resolution reported by Section VII., Physiology and Etiology, offering a prize of two hundred dollars for the best essay on the Etiology of Dental Caries was adopted, and Drs. C. N. Peirce, W. A. Bronson, and E. T. Darby were appointed the committee.

Section VII. was passed.

Section I., Artificial Dentistry, Chemistry, and Metallurgy, was called, and submitted a brief report, calling attention to a filling-material presented by Dr. Robinson; to Reese's cast-gold alloy, and to a formula for making a solder, and a blow-pipe, presented by Dr. Dorrance; also, recommending the reading of the following report, by Dr. T. L. Buckingham, chairman of the Section:

If it was the intention when this association was divided into Sections, to have the chairman confine his report to new improvements, discoveries or additions made in the branch during the previous year, and were I now to comply with such intention, I should make my report very short, for I do not think any decided improvement has been made, though there has been a gradual advance.

With the introduction of rubber as a base, and of sectional blocks made by the manufacturers, the old process of mounting teeth on metallic plates was in a great measure discontinued. While the new process was, to some extent, an improvement on the old, it prevented the advancement which would have taken place had it not been introduced. It requires much skill and nice workmanship to mount a set of teeth on a metallic plate; and when the teeth have to be carved, burned, and ground to fit, and arranged to give the proper

expression to the face, it requires more than ordinary skill to perform the task properly. Teeth are now manufactured in quantities, and all that is required of the dentist is to select such as will come nearest to suiting the case. The fitting to the plate is dispensed with; in fact he does not want them to fit closely to the gum, because the rubber will fill the space. All he has to do is to make close joints and finish smoothly. He may vary the color and size for the different cases and make some a little longer or shorter than others, but they all have the same regular form and look as much alike as shoes, hats or other articles of dress that are sold in the stores.

Natural teeth vary in shape, size, color, and arrangement. If you were to examine all the mouths in this city you could not find two exactly alike, and one of our objects in inserting artificial teeth is to imitate nature. It is therefore evident that teeth made in sectional blocks and arranged as they have to be in regular order cannot imitate natural ones.

Why cannot artificial teeth be made to resemble natural ones? The shape, size, color and arrangement are under our control. To obtain the best results we must not use sectional blocks,—we must have single teeth. Let us see what is within the reach of every dentist who has talent enough to accomplish what he undertakes in artificial dentistry.

First, we have the porcelain composition, which can be made to imitate the natural teeth so nearly that they cannot be told at a very short distance. We have also compositions to imitate the gum near enough to avoid detection. With these we ought to be able to construct teeth that would very nearly resemble the natural ones. Single teeth are also made, very closely resembling the natural organs. In making molds for them the manufacturer selects the best-shaped natural teeth for patterns, and the color is very near like that of good, healthy natural ones. But natural teeth are not always regular in shape, nor are they always uniform in color in the same mouth, and by use they are worn on the cutting edges of the front and the grinding surfaces of the back teeth; so that in a person's mouth of over forty the teeth present a very different appearance from what they did at eighteen or twenty years of age.

As it is our object to represent the natural organs as near as possible, we should grind the teeth off as much as natural ones are worn. The practice is not to grind the teeth on the cutting or grinding surfaces. I say grind them all over if necessary; make them the shape you want; then if the ground surface is polished with pumice on a buff and finished with rotten-stone and oil, a better surface can be made than they possessed when they were burned. Ash & Sons polish their teeth and in doing so give a much more natural surface;

so by grinding and polishing we can make single teeth any shape we wish.

In regard to the color, it is sometimes impossible, with all the varieties there are in the depots, to match the color of some natural teeth. By selecting such as have the color of the body of the natural tooth and using some mineral paint, a tooth can be made to match almost any natural one. Porcelain painting is now so common that the prepared colors can be purchased at any store where they keep artists' materials. Forty years ago they painted all porcelain teeth. When first burned they came out as white as beans and of nearly the same shape. They were then painted and burned again.

In setting an artificial tooth alongside a natural one that has been badly decayed and filled, and perhaps is black on the side opposite the filling, the neck green and the edge blue,—it is impossible to match such a tooth unless we color one. If a tooth is selected of the color of the body of the natural one, ground and fitted to correspond in size and shape, and then painted to match, it may be made to imitate the natural tooth so closely as not to be detected. The painting may be done by any dentist who has skill and taste enough to make a good set of teeth. The mineral colors change very little in burning, unless they are heated much more than is necessary. The burning may be done in a muffle; one of the small furnaces used to make continuous-gum work is the best. If the dentist has not one of these he can use a clean crucible, heating the teeth to a full red heat in an ordinary fire; or they may be burned on a piece of charcoal with a blow-pipe, using a naked flame. All that is required is to heat to nearly the melting point of silver, when the silicious compound with which the paint is mixed fuses and forms an enamel.

After selecting and preparing the teeth to suit the case, the next thing to be done is to arrange them. This requires more than ordinary talent to accomplish properly. Almost any mechanic with a few hours' instruction can put up a set of sectional blocks on a rubber base, and they will be as regular and beautiful as a row of piano keys; but to make teeth irregular and give them a natural appearance to harmonize with the other features of the face requires the talent of an artist. The dentist should not be satisfied when he sees that the teeth are not too short nor to long, are the right color, not too large nor too small, or that they articulate properly. They may be right in all these essential points and yet have a very artificial appearance. He should take pattern after the portrait painter: commence with the patient present and notice not only the teeth, but all the expressions of the face, and arrange the teeth to harmonize with the features so as to give the best expression to them. A photographer sets his subject in a chair so as to get the best light, places the head in a fixed posi-

tion and takes his picture. Everybody knows that a photograph gives no expression; it is only a picture of the person when he is in a quiet, passive condition. The portrait painter will not only give you a picture, but will give expression to it; a little twinkle in the eye or a slight elevation of the lip is transferred to the canvas, so that you not only see the form but also the character of the person. As the artist is not always called upon to paint a beauty or persons of a similar cast of features, so with the dentist. If our patients were all alike in form and expression we might have sets made to suit them. It is not necessary for me to call your attention to the deformity when the natural teeth are lost. The face is then shortened from one to two inches, the lips fall in and the chin comes up to meet the point of the nose, and every muscle of the face below the orbit is changed. Persons who have lost their teeth cannot smile or give a pleasant expression, their cheeks are wrinkled, they have no lateral motion to the under jaw, and in eating they can only roll the food into masses and swallow it without mastication. In fact they would be horrible to look at if we were not so accustomed to seeing them. A writer who is well informed estimates that there are twenty million teeth extracted in this country every year, and at least eight million of artificial ones made. When we consider the various expressions of feeling shown by the face, and the importance of the teeth in speaking and mastication, we may form some estimate of the necessity of replacing them when lost.

In using single teeth it is necessary to have some substitute for the gum. We have two such that answer the purpose well—the continuous-gum body and celluloid. Continuous-gum work has been before the profession so long and its merits have been so highly extolled that I shall give it not more than mention. It certainly makes the most perfect work when it can be used; but there are objections to it—it is heavy, liable to break, and not easily repaired. It has been in use more than thirty years, during which time it has been tried by many who have discarded it, and its use does not appear to be increasing.

Celluloid, when properly made, answers the purpose well. It is cheap, more easily managed, lighter, can be easily repaired, and may be made to imitate the natural gum very closely. It is not necessary to give the chemical composition of this compound. It is known to be made from gun-cotton by adding camphor and some oxide of zinc; a little vermilion is also added to give it color. It softens to a doughy consistence at a temperature of 300° F., when it may be pressed in molds to any shape.

The first step in arranging the teeth is to obtain a base-plate. Wax is used, but it is too soft in the mouth. Wax and paraffine in equal

parts, colored with alkanet root make a good plate; gutta-percha and modelling compound are also used, but the best and most satisfactory is a metallic base-plate. It is not much trouble to make and it will retain its shape and will show if the impression of the mouth is correct. Here we should stop until the plate is a satisfactory adaptation. When this is acccomplished we may arrange the teeth on it by means of paraffine and wax. If the operator will take the trouble he can make the case just as it is wanted when finished. The wax is covered with tin foil, worked into place with a burnisher. Rugæ may be made in wax on the palatine part so as to give a more natural feel to the tongue. The tin foil may be stippled to give a granular appearance. By having the wax covered with foil on both the outside and the palatine surface and making the case on a metal cast, it will require very little finishing after it is pressed.

Single teeth mounted on a gold plate, using celluloid to attach them and to form the gum, makes one of the most satisfactory cases for both the operator and the patient.

In working celluloid many fail from not having a suitable apparatus and from not taking sufficient care. It will soften at 212° F., and it may be pressed into shape at that temperature by using sufficient force. I have known it to be worked with boiling water in an open vessel, but it is only forced into shape and then has a tendency to spring; such cases get out of shape very soon. I have some specimens to show the effects of different temperatures on it. It should be heated to a temperature of 300° F. At this point it is in a doughy condition and may be molded into any form, with the certainty of its retaining its shape when cold, and with no liability to spring.

Discussion.

Dr. Horton. Is the coloring matter that is used in celluloid the same that is used in red rubber?

Dr. Buckingham. Yes.

Dr. Horton. What is the ingredient used to color black rubber?

Dr. Buckingham. Carbon.

Dr. Horton. Is there any poisonous material in that?

Dr. Buckingham. No.

Dr. Horton. What is the difference in the transmission of heat through rubber and through celluloid?

Dr. Buckingham. I do not know. I have never tested the conducting power of the two. I suppose probably they are nearly the same. In vegetable matter there is not much variation in the conduction of heat. There would not be sufficient difference to take into account.

Dr. Hurtt. Dr. Morgan asked the question of Prof. Buckingham, during the reading of his article, if this celluloid could be pressed off or taken from the metal casts if the undercuts were very deep? I was told by a gentleman who had made several hundred cases of this kind, that it can readily be done when the cases are made with plain teeth, that you can spring them off and the celluloid will return to its original position or shape without damage to the plate or arrangement of the teeth.

Dr. Buckingham. If you should have such a case, if you put it in water and heat it to the boiling temperature you can remove the plate. If you are going to use block teeth make the base of rubber, but if you are going to use single teeth for a full set make it of celluloid.

Dr. Morrison. Is there any mode of manipulation by which the integrity of the color of celluloid can be preserved?

Dr. Buckingham. The color of the plates recently made has stood well in ordinary mouths. A person who smokes will color rubber or any other substance unless it be a metallic plate. Some years ago some celluloid put on the market was not good, and the material got into bad repute.

Dr. Atkinson. I wish to speak a few words with regard to principles, and then to present you the discovery that relieves us of all difficulty attendant upon misfits and incompatibility of artificial bases. It is known that if we want to clothe a human body we have to put a non-conductor upon it to prevent the radiation of its normal heat. If we want to substitute any portion of the lost tissues of the body, it is desirable that we have that substitute conform as nearly as possible in conductive or thermal and nutrient currents to the tissues themselves. There has been a discovery of a base made by George F. Reese, which has been of the greatest satisfaction to me; and those who have used it in cases of regulating pronounce it the best base for that purpose they have ever known. I have worn everything in my own mouth that has ever been presented for artificial teeth, and I give you my word that this is the only thing that I could forget while wearing it, the only thing that has seemed to be acceptable to the tissues, so that I did not know anything about its being in my mouth. This has cost a great deal of labor and a great deal of experiment, the difficulty having been that we were so determined to have a high karat of gold. By having too much gold we found that it became brittle. We have finally learned the proper proportion to secure the best results.

Dr. Robinson. I have a lining for celluloid or rubber plate that I wish to present to the Association. Two years ago I found that I was losing my mouth from inflammation and absorption from wear-

ing black rubber, and I went to work to see if I could remedy the difficulty. I finally produced an alloy composed of platinum and tin, with a very small portion of gold, that would adhere to the plate as well as paint does to wood; I give you this illustration because it is the best I can give; I have worn it in my mouth nearly two years. This metal being fibrous has the property of mixing with the plate when the latter is warmed in such a way that it cannot be removed and does not wear off. During the last year, since I have been wearing plates lined with this material in my own mouth, I have examined, perhaps, two hundred mouths in which vegetable plates have been worn, and in almost every one of them there were large patches that were inflamed and red and soft. This is a thing that is, perhaps, worthy of your attention. I found also that this metal would weld to gold, and so I substituted it in the filling of teeth, and I have some fillings here illustrating how it works. You have in this a material that will preserve the walls of the teeth as well as gold, and you may renew it with gold if you desire. This material will not soil or grow dark in the tooth, and will eventually take the place of amalgams, and is most excellent for filling the deciduous teeth and for starting fillings, instead of retaining-points. It will stand and do good service in all cavities with surrounding walls, and in most cases, when covered with gold, will make a filling as good or better than gold itself.

Dr. Hurtt. I have been made to feel this morning as I have not for twenty years the degrading influence of what has been going on. I do not generally use very strong language, but I do wish to speak my mind here to-day on this subject, and on the proceedings at this time. I came to this association expecting to witness the transactions of the most eminent men of this country. I expected to hear principles discussed, and to hear reports of the best things in practice that had been devised by our best men for our benefit and for the benefit of our patrons and the rising dental students. What have we witnessed here?

Chairman. I believe I must call the gentleman to order.

Dr. Hurtt. I appeal to the American Dental Association in order that I may proceed on this subject.

Chairman. I decide that the gentleman is not speaking upon the subject of artificial dentistry.

Dr. Thomas. I move that Dr. Hurtt be allowed to be heard.

The motion was agreed to.

Dr. Hurtt. I have been taught from the time that I entered a dentist's office not to engage in anything in the direction of mechanical dentistry that would degrade the profession. I have been taught that no man had a right to bring mechanical appliances or patented

methods into an association of this character, to press their purchase upon the profession. It pains me when I find a gentleman, like Dr. William H. Atkinson, of New York City, one of those to whom I have looked for the best things in dentistry, one of the great lights of our profession in this country, coming here with circulars setting forth devices that they have introduced and patented, and now advertising and urging their claims, as has been just done before this association. Are we a committee to sit here and judge of dental patents and materials, and to put the seal of the association upon them? This is what I object to. What are we to expect from students if such things are allowed here? Suppose a young man from Kansas should come here with a similar article, and, under similar circumstances, attempt a thing of this kind; would the President of the association permit it? Would the American Dental Association allow it? There are professors in dental colleges here to-day, who have taught that such practices are unprofessional, and in many instances they would not associate with those who do this kind of business.

In this great representative American Dental Association, the teaching and example should be elevating, not degrading, and such appliances or materials, if on sale, should be placed before the members of the association through the proper advertising channels.

One thing in regard to celluloid. I have made a number of celluloid plates, and find that men who use alcoholic liquor, as a rule, cannot wear them. In several cases, I have seen from one-half to two-thirds of the plate eaten off within a year's time by the use of alcoholic liquors.

I thank you for the privilege you have accorded me.

Dr. Buckingham. I did not bring anything here to sell; I simply showed you a model and a method. I do not sell celluloid. I have a right to speak of the properties of celluloid as much as others to speak of the properties of gold. It is no humbug. I do not bring any secret compound here to show you. I simply wish to give the young men here some instructions in the use of the material that is in use. I do not say that it is the best material in use. I do not come here with quackery, or any secret process. I do not want to be classed with the men that the gentleman speaks of. I disclaim any thought of urging anything in which I have any pecuniary or proprietary right. The others may take care of themselves.

Dr. Hurtt. I did not, in my remarks, have any reference to what Professor Buckingham had said or done. I merely wished to call the attention of the professors who are here to this subject, hoping that they might impress upon their students the right principles governing this question. I merely wish to assert what I believe to be the

fundamental principles underlying these matters, which have been taught by many good men in our profession, and I think ought to be handed down.

Chairman. In explanation to Dr. Hurtt, the chair would state that he was under the impression that these gentlemen who spoke and brought these things before the association, did so on the recommendation of the committee of the Section; otherwise he would not have permitted it.

Dr. W. H. Dorrance, Ann Arbor, Michigan, read a paper entitled "The Ill Results Produced by the Use of Artificial Dentures upon Plastic Bases." *

Dr. Dorrance was requested to procure the manufacture of his blow-pipes, to enable the profession to obtain them.

Section I. was passed.

A discussion ensued upon a motion of Dr. Crouse to appropriate three hundred dollars for the purpose of securing the tabulation of the skulls in the various collections in the country, with regard to the existence of dental caries. The motion was finally negatived.

Adjourned.

(To be continued.)

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

A REGULAR meeting of the First District Dental Society, State of New York, was held Tuesday evening, May 2, 1882, at 8 o'clock.

The President, Dr. A. L. Northrop, in the chair.

One of the business questions discussed was that referring to the publication of the society's proceedings in meetings and clinics. It was determined by a unanimous vote to publish the same in the DENTAL COSMOS. The following is the first publication under that vote:

Dr. Wm. T. La Roche exhibited his pneumatic mallet in its attachment to the dental engine, and gave the following description of the apparatus:

"Gentlemen: I have here a dental engine, to which I have added an attachment to run a pneumatic mallet. By this method great rapidity of stroke is obtained, almost equaling that of the electric mallet, just as effectual in action as the latter, and much more agreeable to the patient. This blow is more nearly equivalent to that of the hand-mallet than the blow from any other source, with all

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* This paper will be found on page 626 of the current number of the DENTAL COSMOS.

the advantages of the electric in addition. The force of the blow is easily and simply controlled by holding the flexible tube between the teeth and checking the air, partly or wholly, in its passage to the instrument. It is easily capable of use as a hand-plugger in alternation with its own blow. Several mallets may be in use during one operation, each carrying a different point, and all working from the one engine. The instrument is very simple, not liable to derangements, and easily manipulated. The attachment was made for me by Wm. H. Dibble, of Middletown, Conn. I hope the apparatus will be of benefit to the profession."

Dr. James E. Dexter then read the following paper, entitled "Arsenic in Saving Pulps:"

Mr. President and Gentlemen: At a meeting of the New York Odontological Society, in April last, Dr. C. F. W. Bödecker, in the latter part of his able paper on the "Minute Anatomy, Physiology, Pathology, and Therapeutics of the Dental Pulp," described a method of pulp-treatment taken from the work of Dr. Witzel, a dentist of Germany; which method appears to contain principles well worth examination, as well for their novelty as for their boldness.

Dr. Witzel's general proposition is to partially destroy the coronal portion of a pulp with arsenious acid, amputate the deadened part, and then cap the remaining root-portion or portions, expecting them to remain in a healthy condition under the cap. He states, however, that he looks for success only in cases of healthy, or very slightly inflamed, tissue.

The operation has for its object the saving alive of at least a portion of the pulp in the root-canals; its originator arguing that the teeth so left are less liable to future disturbance than those from which the pulp has been wholly extirpated. The detail of an operation is as follows:

In a case of exposure and slight inflammation of the coronal portion of a molar pulp, upper or lower, the cavity of decay is first carefully and thoroughly excavated, the pulp exposed, and the cavity flooded with the following formula:

℞.—Acid. carbol. (cryst.), .15 c.g.
Tinc. aconit. rad.,
Aq. menth. piper., *āā*, .05 "
Glycerin., .02 "
Acid. tannic., .03 "
Ol. menth. piper.,
Ol. caryophyll., *āā*, gtt., xxv.,—M.

This is allowed to remain upon the exposed pulp from five to ten minutes; after which it is replaced by a paste of arsenious acid and morphia, which is left in the cavity (of course, properly covered),

from twelve to twenty-four hours. The paste is then removed, the cavity flooded with a five per-cent. aqueous solution of carbolic acid, and a sharp bur in the engine is plunged into the deadened pulp, and, by a rapid sweep, quickly severs the coronal portion from those in the canals. The severed part is now removed, and the cavity again filled with the five per-cent. solution of carbolic acid; which, when the bleeding has ceased, is succeeded by the formula given above for a few minutes. The cavity is then syringed with warm water, dried, and then (including the pulp-stumps) varnished with, first, a solution of mastic with a little carbolic acid in alcohol, and then with 'pulp varnish,' (solution of gun-cotton, gutta-percha, colophony, and a little carbolic acid); after which a cap of 'carbolic-acid cement' is applied, and the tooth is then filled in the ordinary manner.

The 'carbolic-acid cement' just named, is prepared after the following formula:

℞.—Acid. carbol.,	5.0 c.g.		
Alcohol. abs.,	2.0	"	
Aquæ dest.,	40.0	"	
Glycerin.,	20.0	"	—M.

To this add an equal quantity of the solution of chloride of zinc used for fillings; and to q.s. of the whole for any operation, add sufficient oxide of zinc to form a paste of the consistence of thick cream.

It is claimed that the formula applied previously to the arsenical paste is sufficiently antagonistic to that agent to prevent its more than superficial action, thus lessening the danger of total devitalization.

The details following the removal of the arsenic are performed upon what may be called the antiseptic principle; that is, the severed pulp-remains are kept covered with the carbolic-acid solution, in which, also, the instruments are all dipped; and to conclude, the protective cement applied just before filling, is claimed to obviate all danger of after-disturbance of the remains of the pulp.

We have long been taught that the presence of arsenic in a living tooth for a period of some hours, say twelve to twenty-four, will almost surely result in the total devitalization of the pulp which it contains. Exceptions there are to this general rule as to the time consumed in the process; but I do not believe that many would rely upon such exceptions by allowing arsenic to remain even for a less period than twelve hours in a tooth which they wished to keep alive.

The action of arsenic upon living tissues is, strictly speaking, but little understood. In fact, our principal certainty in regard to it is,

that it will kill. But the time in which it will perform that operation is governed by factors mostly beyond our present knowledge. What is known as the general vitality of the patient appears to exert a powerful influence in the problem, but even this is by no means invariable in its action. Nor do the qualities of sex, age, or condition of the pulp itself, give us much more certain aids to the prognosis of arsenical action.

The addition of various medicaments to the arsenic placed in the tooth, while affecting some characteristics of its action, as the mitigating of pain, does not seem, so far as observed, to have affected its power to kill in any appreciable degree.

Under these circumstances the proposition to leave and cover healthy remains of a pulp after treating with arsenic, strikes us, to say the least, as somewhat startling.

Authorities on therapeutics are practically unanimous as to the effects of arsenic on the tissues, so far as those effects are known. In "Harris's Dictionary of Dental Surgery" we find the following: "The application of the fortieth or fiftieth part of a grain with an equal quantity of the sulphate of morphia to an exposed dental pulp will destroy its vitality in from three to seven hours, and often without causing any unpleasant sensation, but in most instances it is productive of pain." * * * * "Arsenious acid is also employed to obtund sensibility of dentine; but it is a dangerous agent, as its effects often extend to the pulp of the tooth."

Dr. Taft, in his "Operative Dentistry," says: "All dentists are aware of the fact that a tooth-pulp may be destroyed by arsenic through a wall of considerable thickness." * * * * "Indeed, the vitality of the whole crown of the tooth, both dentine and pulp, is often destroyed by the use of this remedy applied to even a small cavity."

How arsenic destroys the life of tissues is unknown; but we do know that it is a powerful irritant and escharotic. We also know that arsenious acid is absorbed (carried into the circulation) by the parts to which it is applied.

Pereira says: "When arsenious acid is swallowed or otherwise applied to a living surface, it becomes absorbed. The absorption of it is now no longer a matter of doubt, for arsenic has been detected in the blood, in the animal tissues, (liver, spleen, kidneys, stomach, and muscles), and in the urine."

Biddle says: "The absorption of arsenious acid into the system, after its administration, is shown by its presence in the blood, viscera, bile, urine, etc."

Taft says: "The arsenic will be carried to different parts of the system, and its specific influence manifested wherever it goes." * * *

"In many cases when it is applied to a pulp of a tooth, more or less disturbance of the periosteum is exhibited a short time after—in some instances a few hours, and in others after several days." * * * * "The length of time the preparation should remain in the tooth will be determined from the condition of the pulp when it is applied, the age of the patient, the vascularity of the dentine, the susceptibility of the patient to the influence of arsenic, and like circumstances. It will usually be from three to twenty-four hours, * * * * and cases occasionally occur in which it seems almost impossible to destroy the vitality of the pulp with arsenic." * * * * "Hence it is quite obvious that there is a great diversity of susceptibility to the influence of arsenic, and that the study of these idiosyncrasies is both interesting and valuable." * * * *

"From the foregoing, in regard to arsenic as an application for destroying the pulps of teeth, the following conclusions are justly deducible: it is, in general, very efficient; it is a heroic agent; it should in all cases be used with great caution; in some cases it is entirely inadmissible; a free administration of it is liable to be followed by bad consequences; and skill and care, rather than counteracting agents, are to be relied upon in its application."

Very probably it had not been necessary before this audience to cite authorities upon the certainties and uncertainties of arsenical action. My excuse is, the seeming neglect, by the new theory, of such authorities. I do not intend, at this time, to deny any possible value to that theory; for its novelty forbids. But it has seemed to me that, inviting us, as it certainly does, to a system of practice so directly opposed to all previous experience, and yet one having so desirable an object, the new theory demands at our hands something more than friendly ridicule or contemptuous neglect. Indeed, I think all will acknowledge that any system of practice which will offer a reasonable certainty of preserving alive and in a healthy condition even a portion of a diseased pulp, will be a "consummation devoutly to be wished."

Discussion.

Dr. C. F. W. Bōdecker. The correct treatment of the dental pulp can be pursued only by those who have a correct knowledge of the minute anatomy, physiology, and pathology of that organ. In 1879, when Witzel's work was published, I had it noticed by the chairman of the Section on Dental Literature of the American Dental Association, at its meeting at Niagara. At that time I did not agree with Witzel's conclusions, simply because I had not then studied pulp anatomy and physiology sufficiently to understand him correctly. Since that date, however, I have earnestly investigated the minute

anatomy, and also the pathology of the organ. Its anatomy I have found imperfectly described in almost every work I have seen. Correctly, the pulp is composed of myxomatous tissues from the beginning of its existence until its death,—except in its pathological state. Changes into fibrous tissue, into bone, or even into dentine, may arise from an inflammatory state of the organ; and when it once returns to the medullary condition, it can never again become myxomatous tissue. Thenceforth it is, so to say, pathological. This is not *strictly* so; but there is a formation going on which does not belong, normally, to the pulp.

Witzel says, (and in this I agree with him), that in anterior roots of lower molars, in buccal roots of upper molars, and in first bicuspid roots, we can seldom perfectly extirpate the pulp; that a molar filled over a perfectly healthy stump is in much better condition than one containing a dead stump. Witzel says he applies the first-described formula in order to make the action of the arsenious acid superficial; but he does not claim that the action of arsenic is always the same. The latter statement I have verified by direct experiment. I have applied arsenic to healthy pulps (in cases where the tooth was doomed, from other cause, to extraction), and have found them, after twenty-four hours of exposure to the agent, very superficially affected, the root-portions being in a perfectly normal condition, without any hyperemia. If the pulp had been slightly inflamed, however, the arsenic acted very differently. All the inflamed part was quickly destroyed, and the action extended more deeply into the healthy parts than in the other cases. In cases of total inflammation, the arsenical action could be observed to have penetrated the entire pulp in three hours.

Up to this time very little has been said or written upon discrimination in pulp-diagnosis. Really, the treatment should depend upon the condition of the organ at the time. I should look for the preservation of molar pulp-stumps mainly under the following circumstances: when a healthy pulp has been unintentionally exposed and wounded; when a pulp has ached, slightly, from the presence or pressure of a filling, the pain ceasing when the filling is removed; and, generally, in cases of very slight inflammation of the coronal portions of pulps. In such cases, I should expect that the root-portions certainly could be saved; and, of course, in some cases, the whole pulp. In cases of severe inflammation, long continued, the whole pulp would very probably be doomed to extirpation; but where the root-portions have not become inflamed, or where a part of the coronal portion has been slightly inflamed or injured, the stumps, or even the whole pulp may be saved.

Dr. Frank Abbott. It would be entertaining and instructive, could

we listen to Dr. Witzel, himself, on this subject. However, I do not think I could subscribe to this method of treatment. I should not like to place dependence upon my ability to cut off exactly that quantity of the pulp affected by the arsenic, leaving none of the poison behind. I do not see how this can be done,—even with the aid of the formula which Dr. Witzel previously applies. I am quite well aware that pulps are amputated, and the stumps saved without arsenic, and with (I think) quite as little pain as if arsenic had been used. I cannot, at present, see any benefit to the operation from the use of arsenic. Should a small portion of a pulp become exposed and suppurate, that portion may be cut away with quite as little pain, I imagine, as would occur after the use of arsenic.

Dr. Bōdecker. Dr. Witzel does not intend that the arsenical action should be carried deeply. His object is to obtain sufficient superficial action to allow of the chamber being painlessly opened, so that the desired portion of the pulp may be removed by a sweep of the bur. Of course, a pulp may be amputated, while alive, without arsenic; but the opening into the chamber is much more painful than cutting the pulp itself. Had I an approximal decay, where I could push in the bur so as to amputate without opening through the grinding surface, I should not use arsenic. But a cavity in the grinding surface, surrounded by hard walls, I think few patients would submit to opening sufficiently to allow of amputation without some pain-killing application previously made. The direct action of arsenious acid is, as I have many times seen, mainly peripheral. Touching an exposed pulp is, of course, followed by much pain; but application of arsenious acid renders it so insensible as to allow of perfect freedom in opening the chamber and amputating.

Dr. Abbott. Still, I cannot see the necessity for the use of arsenic in the connections supposed. Will the stumps be more likely to be saved because arsenic has been used? Capping exposures, properly done, saves many teeth, as we all know. Will amputation after arsenic save more? A pulp entirely inflamed is pretty sure to die; but pulp-inflammation is, *at first*, local, and not general; and if the case be taken at this time, simple bleeding of the organ, and application of salt and water will generally save it. Must we, in such cases, use arsenic? As to pain, that need not always be so great in pulp operations as is inferred. I have capped very large exposures, after amputating fungous growths, with but little pain. I take a fine cotton cord, saturate it with tincture of aconite root, and work it down around the growth in the cavity, winding it two or three times around the growth, and leave it there, while I do other work, for a quarter or half an hour. Then I gently remove the thread, and with a round-bladed, spoon-shaped instrument, worked down

to the neck of the growth, cut it off with one cut, with very little pain. The exposure thus made is capped.

Dr. W. H. Atkinson. I wish these points were better investigated. If they had been, we should be more definite and exact in our conclusions regarding them. What takes place in pulp-inflammation? The primal disturbance occurs in the nutrient circulation, and the consentaneous movements of the living matter are thus affected. Nature then establishes several methods of accommodation to the circumstances; and it is our failure to distinguish between these, and to apply the proper treatment for each, that leads us to disaster. Arsenious acid acts by arresting all nutrient currents. At once a line of demarkation is established, and a slough occurs. A portion of the pulp-tissue is converted, by retrograde metamorphosis, into fibrous connective tissue. Following this may occur calcific deposits, which, impinging upon nerve-filaments, produce neuralgia.

Dr. O. A. Jarvis. We have heard much in dental discussions about saving pulps. We have almost been told that it is a sin ever to attempt their destruction. But some express sounder doctrines. I think Dr. Bödecker's doctrines excellent. Many times have I found the pulp in one or two roots dead, even decomposed, and the remainder healthy. Stumps will be well preserved in mouths where the general systemic condition is favorable; but in opposite conditions the same stumps would cause trouble. No cast-iron rule can be laid down for pulp-treatment. Each case must be a law unto itself. Generally, however, I hold it best to remove diseased portions. I cannot see any necessity for the use of arsenic. Any spirit will effect the same results without any danger. Alcohol and salicylic acid have been named, but it is the alcohol that does the work. If it is desired to destroy a pulp, seal up a little laudanum in the cavity, and the alcohol in the tincture will effect your object without risk of harm to surrounding tissues, besides allowing you to remove the whole pulp efficiently.

Dr. Abbott. Dr. Bödecker's investigations show that we seldom find pulps in a perfectly normal condition. A simple irritation induces a deposit of lime-salts in the pulp-tissue in, perhaps, a dozen places. Here is a condition not normal. Were we to apply arsenic, then, to every imperfect pulp, we should be incessantly employed in pulp-extirpation. In fact, it is impossible for us to always decide just *where* pulp trouble lies; and application of arsenic to, and amputation of, the *presenting portion* will not be certain, by any means, to cure the lesion before us.

Dr. Bödecker. I have found very few exposed pulps that did not contain calcific deposits,—lime-salts deposited in the pulp-tissue, inclosed in a very delicate sheath of connective tissue. Dr. Abbott

says this condition is pathological. I do not know what to say as to that. We know very little about the point where physiological action ends and pathological action begins. I can say only this,—that many observers have found the (so-called) pulp-stones in the dental pulps of many animals besides man,—as pigs, dogs, rabbits, and squirrels. This would not seem to indicate that a pathological condition is necessary to these deposits.

Adjourned.

JAMES E. DEXTER, *Secretary.*

EDITORIAL.

AMERICAN DENTAL CONVENTION.

IN reply to inquiries as to why the proceedings of the American Dental Convention have not appeared in the DENTAL COSMOS, we have to say that no report has been received by us, though Dr. J. G. Ambler writes that one was duly forwarded for publication. It, however, never came to hand.

PERSONAL.

WE are requested to state that Dr. J. G. Van Marter, who has for several years been in the practice of dentistry at Florence, Italy, has changed his residence and field of labor to Rome.

WE are requested to state that Dr. W. C. Barrett, of Buffalo, takes entire control of the dental department of the *Independent Practitioner.* In view of Dr. Barrett's recent criticisms upon the conduct of the dental journals, we shall hope to see a dental periodical not open to the objections which were so patent to him in existing journals; in other words, to see one "deep," as well as "broad;" free from "padding;" with no "borrowed" articles, but filled with "original essays" and "primary thought" on "basal principles." Dr. Barrett has our best wishes in his new departure.

BIBLIOGRAPHICAL.

ODONTOLOGISCHE FORSCHUNGEN. Von DR. ROBERT BAUME, Verfasser des Lehrbuchs der Zahnheilkunde und Redacteur der *Vierteljahrsschrift für Zahnheilkunde*, in Berlin. Verlag von Arthur Felix: Leipzig, 1882.

The distinguished author of the above work has given to the

world a striking evidence of what one man can accomplish by thorough and persistent labor. It is but a comparatively short time (1877) since he issued a work on dentistry of six hundred and seven pages—probably the most original and thorough treatise on the subject in the German language. Not satisfied with this, he now gives us, in addition, his "Odontological Investigations," in two volumes, which comprise the labors of ten years. In the preface he explains the origin of the work, which is best given in a translation of his own language:

"In the year 1871 I first discovered in the human teeth many peculiar malformations. They were very diminutive, without form or a trace of enamel, and remained imbedded in the jaw. They seemed to be allied to the rudimental development of human teeth, which is widely separated from all other formations. When I first observed these strange malformations, I regarded them as of no significance, but after I had discovered a large number, invariably in the same place in the jaw, the question arose whether they were not, perhaps, rudiments, of fixed morphological importance. I have made for the past ten years odontological studies of the nature of these rudiments.

"The present work originated as an attempt to follow the teeth from their entrance into the organization of the vertebrata, through all changes of form to their destruction. From the wealth of tooth-structure of living, and, especially, fossil animals, extensive material is offered for such an attempt. On the other hand, every foothold for the comprehension of a gradual change in tooth-substance is so far lacking.

"I divide the results of my investigations into two parts. The first enters into the consideration of the development of the teeth, while the second is occupied with the defects of the hard tissues, and their increase. In the first part I have chosen, as an introduction, a short review of the theory of selection, from which point I started in my investigations. My purpose in so doing is to call the attention of those readers who are not sufficiently familiar with the teachings of Darwin, their most important points, and, moreover, to define certain views. * * *

"The introduction is followed by the consideration of the armor of the vertebrata, the teeth of the fishes, amphibia, and reptilia, before I reach my principal aim, which is an attempt to describe the gradual development of tooth-forms of the mammals, and the law which lies at the foundation of all changes in dental structure. The work is not intended as an odontography. The classical works of Owen and Giebel render any attempt of this kind superfluous.

"My purpose is not to describe the forms, but the laws which

govern the condition of development of forms. I have, moreover, not worked systematically.

"For the sake of brevity, I desire to repeat the results of my investigations in detail, and only to touch upon known facts for the sake of connection, and that in the most condensed form possible.

"In the present work are a large number of separate investigations which contain new facts. I hope that the results of these, as well as the idea of the whole, will find appreciation. This is a first step in a new direction; I may, therefore, well lay claim to a considerate judgment."

The first volume is entitled "Investigations into the History of the Development of the Teeth," and comprises the following subjects, which will give a clear idea of the matter:

"Introduction; the selection theory; the armor of the vertebrata; placoid scales and teeth; the teeth of the fish; the teeth of the amphibia and reptilia; the development of the mammalian teeth; the reduction (in numbers) of the teeth; the implantation (Befestigung) of the mammalian teeth; the hard tissues of the teeth; the physiology of tooth substance; the mammals; the rootless or continually growing teeth of mammals; development of the crown and root from continuously developed teeth to special forms; the change in the forms of dental structure; higher development of single teeth; retrogression and loss of other teeth; the deciduous teeth; the apparent double dentition (Scheindiphyodontismus) of the mammals; the third dentition; from the typical number of the mammalian jaw to the present time; the reduction of the teeth in the homodonts; the last rudiments of lost teeth in the jaws of other mammals; reappearance; teeth and organisms."

On page twenty-one, the author writes as follows: "I have undertaken a new series of investigations, with *scyllium catulus* and *carcharias acutus.* I take it for granted that both mentioned sharks are subject, as all others, to the same conditions in regard to the development of their placoid scales. This supposition is mainly supported by Hertwig's diagrams. By this, the results I have arrived at attain a more general character, but I must say, at the very beginning, that I have seen much in my investigations that is different. I arrive, first of all, at an entirely opposite explanation of the character of the placoid scale. I have carefully and especially studied, for this purpose, the development of the individual parts of this scale.

"The skin of the shark is covered with peculiar string-like formations. The spurs lie in a series of slanted lines, all with their points towards the tail. The spurs have a very marked similarity to the teeth of these fishes so far as form, and even structure, are con-

cerned. This has, so far, struck every observer who has occupied himself with the study of these conditions. Agassiz, and others, lay stress upon the fact. Many authors have named these spur-like formations *skin*-teeth. At present they are known as placoid scales, and how far they can be rightly given that title will appear later.

"Fig. 5 on the opposite page represents a saggital cut through the skin of the abdomen and the under jaw of a *scyllium catulus* about ten centimeters in length. In an animal of this size, the external skin still immediately surrounds the under jaw and continues into the cavity of the mouth. It can be seen very plainly how the placoid scales develop into teeth. It seems without doubt evident that the formations are homologous. It is only when the lips are formed that a separation of the dental structure from the placoid scales takes place." * * * If I take all the facts discussed previously and if I consider their construction and arrangement in the skin, and especially the development of the base-plate; the only possible conclusion, in my opinion, is that the base-plate of the placoid scale is homologous with the socket, which renders possible the attachment of the spurs to the armored coat (Hautpanzer)."

Further on our author discusses the comparative development of the skeleton with the mailed coat, of which, being of interest in this connection, we quote a portion:

"The armor of all very ancient fishes was formerly stronger and consisted of decidedly thicker plates of bone. Even with existing fishes that are provided with strong armor, the skeleton is much less ossified. The skeleton and the armor preserve, even with the fossil forms a remarkable balance. Quenstädt (on "Petrifactions") especially emphasizes that the thickness of the mailed coat of fossil ganoids stands in antithesis to the ossification of the skeleton; the thicker and more massive the scales are the less the internal skeleton has of inorganic material. According to all this the conclusion is inevitable that as the internal skeleton advances toward perfection the armored coat is diminished and separated into various parts. The component elements of the coat of mail were employed in the development of the internal skeleton. The lime-salts were taken from the outer cuticle and devoted to the skeleton. This process further explains, in a simple manner, the fact that since the discovery of the oldest remains of fishes, a decided retrogression of the mail-coat has taken place; a reduction of the armored coat in volume, in connection with the development of the skeleton from the earliest traces of vertebrates to the present day, is quite certain." * * * *

A brief extract in regard to his views on horn and teeth is here given:

"It is thus seen that the horny developments gradually take the

place of the osseous formations. The same course can be followed in the teeth. It should not be imagined, as has already happened in relation to the teeth, that the horn teeth have originated from the dentine teeth. This is certainly not the case, as both formations, horn and bone, have been developed side by side. An excellent example is offered to us, at the present time, in the armadillo, on which a scanty growth of hair rises above the horn-covered bony coat of mail. In this case one is not merged into the other, but all three formations—bone, horny scales, and hair, stand side by side. Which of the two, the coat of mail or the hair, has secured the preponderance in the organism of the mammals, the hairy covering of the majority of those of the present day can show. We referred to the horn teeth; these did not originate in the dentine teeth. I will hereafter follow the gradation of tooth-structure from class to class of the vertebrates and from order to order of the mammals."

It would be instructive and interesting to quote freely from the pages that follow on the "development of the teeth of mammals." The original matter and clear illustrations make this portion one of the most valuable of the work, but unless the illustrations were also copied, the text would not be understood. They are therefore reluctantly passed over, to page 78, where he writes briefly on the "reduction in number of the teeth."

"If we review the development of the teeth from the placoid scales we observe a very important circumstance—fewer teeth are produced from class to class. In the selachia we observe not only the cavity of the mouth armed with many rows of teeth, but in these animals the whole body is covered with formations, homologous to the teeth. In many Teleostea of the present day, the whole cavity of the mouth is armed with teeth clear to the pharynx. Teeth are produced in fishes in endless number and sequence.

"In the amphibia there are few bones in the cavity of the mouth furnished with teeth except the jaws. The number of the teeth of amphibia is, in comparison to the fishes, decidedly small. In the reptiles there is a still greater limitation in the production of tooth-substance, and, moreover, the changing of teeth does not take place so rapidly, as the diminished number of germs proves."

From the chapter devoted to the consideration of the "physiology of the tooth-tissues," the following is quoted:

"After the enamel is consolidated, the matrix disappears, and a reproduction is impossible. Yet the enamel changes at times; where in former years it was dull and without a fine surface, it becomes, at a later period, finely polished, peculiarly with persons who brush their teeth very much. By this brushing of the teeth, and by their constantly undergoing the process of wear, there is induced, in

course of years, a bright surface, which is erroneously supposed to be due to a change in the enamel. This change lies not in the structure, but has been accomplished through friction.

Dentine and cement possess cell-elements. Vessels and nerves, in spite of all efforts, have not yet been, according to the history of development, discovered. The appearance of vessels and nerves in dentine is, moreover, improbable. Should an accidental discovery demonstrate the possibility of the appearance of these elements, it would not, in our opinion, alter the fact that vessels and nerves do not occur in dentine. * * * The dentine of man, and of most of the vertebrata stands, so far as the vascularity is concerned, upon a very low grade. The more or less thick dentine wall receives nourishment from a single pulp in the middle of the tooth. Many teeth of edentata, of orycteropus and the tusk (Stosszahn) of frichechus rosmarus have a wider range of vascularity. Increased vascularity is a proof, of an inferior grade of formative material (Bildungsstufe). The fact that vascular canals are found occasionally in dentine in all vertebrates, as an anomaly, is not evidence of the highest principle of tooth-formation, for the more passages throughout the dentine, the more porous must the tooth become, and the less perfectly will it be able to fulfill its functions. It will be less able to resist the destructive influences of the mouth. The more the results are distributed in the dentine, the lower will be the animal in tooth-formation, and also in its whole organism. This can be noticed in the character of most fishes' teeth which have, in comparison to those of the vertebrates, but little value. We find in these an increased vascularity of varied forms, yet the fish teeth, as teeth, are not deficient in power. * * * If the vascularity of the dentine of the mammal fails, the conclusion cannot be maintained that there is a failure in the fluid circulation, or a change of material. The dentine is penetrated by many minute canals, communicating with one another by numerous branches. The entire canal system is penetrated by delicate filaments which are continuations of the odontoblasts and stand in immediate connection with the pulp. Through these, it appears, circulation and nutrition take place. We are not able to observe this circulation, but must base our conclusion upon pathological changes. It must be accepted that a morbid secretion of the pulp can pass into the tubuli. The cases worthy of consideration as illustrations are as follows:

"1. We observe under many conditions that teeth possess a red color. The color proceeds from a red coloring, matter which has penetrated into the tubuli. It it understood that this is the coloring of the blood which passes into the tubuli. The return of the coloring matter to the pulp is not possible, because such pulps are usually destroyed by the hemorrhage.

"2. In the icterus this return is apparent. The yellow of the teeth becomes a deeper yellow. In many cases the color is intense. The general opinion held, and probably the correct one, is that the gall coloring-matter produces the yellow color. As soon as the gall-secretion returns to normal the coloring-matter gradually disappears from all the tissues, and also from the teeth, which finally regain normal color. The coloring-matter is thus deposited here to vanish, subsequently, from the canals.

"3. In both the preceding cases the coloring is not generally very extended. Far more striking appearances present in senile dentine, observable in single districts possessing few canals, or in those of larger areas. This transparency is not confined to senile dentine, but is also the result of inflammation of the pulp, and of pericementitis, affecting contiguous parts to a greater or less extent.

"Microscopically, we notice a swelling of the dentine-canals, which is produced by an enlargement of the basis-substance. The explanation of this appearance is that there is doubtless a saturation of the basis-substance of the dentine with an abnormal secretion, which is caused by a diseased or senile pulp.

"We recognize the fact that a circulation exists by this deposition of colored matter. The deposition of the gall coloring-particles and their subsequent disappearance, demonstrates the endosmotic and exosmotic process. In transparent dentine we observe that the secretion of the pulp is forced into the canaliculi and operates upon the basis-substance, which from this cause will always be poor in lime-salts, and swollen."

The following brief extract from his views on development is of interest:

"As I followed the development of the teeth of the vertebrata, it was of vital importance to me to render these conditions clear. My object was to decide whether the germ of the permanent tooth was derived from the deciduous tooth. I decided, therefore, upon many grounds that not two but only one origin could exist for tooth-development. I undertook, therefore, the very thorough investigations previously described. These presented prominently the surprising fact that the germ of the deciduous received its epithelial portion, necessary to the enamel production, from the matrix, which I have described as a primitive fold; after it had absorbed its share, the deciduous tooth was separated from its origin. That portion of the epithelium assigned to it is exactly sufficient for the formation of its enamel. The so-called external epithelium of the enamel-organ is, as previously described in similar cases, lost by isolation from the common primitive fold. The deciduous germ certainly does not furnish an epithelium, because, outside of modifying the enamel-cells,

it does not possess an inner epithelium. *It positively follows, therefore, that the primitive fold, the portion which remains of the returned epithelium, and which is no longer connected with the deciduous germ, becomes the matrix of the enamel-germ of the permanent tooth.* Both originate from one and the same matrix."

A paragraph quoted from the chapter on "The last rudiments of lost teeth, etc., in supernumerary teeth," must close the review of the first volume:

"The presence of supernumerary teeth on the median line and in the region of the pre-molars I regard as evidence of retrogression. How this is in other teeth I cannot say. It may, however, be accepted that all supernumerary teeth have a common origin.

"Teeth have probably disappeared from all places, even in the region of the molars, so that the occasional appearance of emboliform teeth can cause no astonishment.

"I believe I have the proof that the supernumeraries of the central incisors and also more particularly of the pre-molars are indications of a retrogression.

The second volume is confined to the consideration of the "Defects of the Dense Tissues of the Teeth." The contents are comprised under the following titles: The hereditary defects of the hard tissues of the teeth and the possibility of these being inherited and increased through civilization; defects in the interior of the teeth; the so-called dentine abscess; defects in dentine, as failure in formation and loss of substance through resorption; odontoporosis, congenita et acquisita the wasting of the teeth; abrasion; exfoliatio eboris; caries dentium; tooth-caries; tooth-decomposition; tooth-destruction.

Space will not permit an extended review of this portion of the work. While the first volume, in the words of the author, followed "the teeth from their entrance into the organism through all changes of form, to their loss." The second part "considers the defects of the teeth and the possible hereditary increase of these in civilization." This furnishes a complete chain from the first page to the last.

In the selections given no attempt has been made to do justice either to the subjects treated, or to the author, for this would be impossible unless the whole work were translated. The object aimed at was to give English readers some idea of the scope, and of the labor devoted to it, as well as of the thoroughness of the investigations.

That the author has laid himself liable to criticism is frequently evident, and doubtless many of his positions will be controverted, but this is not the place nor time to meet them. In the presence of a work of this magnitude, mere captious criticism is silenced, the

tendency being rather to over- than under-estimate its value. In the judgment of the writer this work will take rank, not only as an authority, *but as the most original work on the subjects treated* that has appeared in a long period.

To the names of Owen, Giebel, the Tomeses (elder and younger), must now be added that of Baume, whose work seems to be a fitting accompaniment, and in a measure illustrates all that has preceded it on the comparative anatomy of the teeth.

It is to be hoped that the author will take measures to have this presented in English dress, for it must be evident it would receive a warm welcome in that language among all scientific minds. Until this is done we would cordially recommend it to all who can read it in the original.—J. T.

Zahntechnischer Kalender, 1883, für Zahnkünstler und Zahnärzte. Herausgegeben von A. Polscher in Dresden und H. Spörl in Wettringen. Dresden, 1883.

This calendar, prepared for German dentists, for use in registering appointments, has some original features worthy of adoption elsewhere, with modification. An entire page is given to each day in the year, divided into four sections, in three of which the teeth of the upper and under jaw are represented by figures, beginning at the median line, right and left. At the top of the page the dentist is furnished with symbols for use in designating materials and character of operation to be performed. The plan seems to be an excelient one, avoiding the use of cuts, which are always confusing. Had the sections containing figures been carried to near the bottom of the page it would have increased the value of the calendar for, as at present arranged, there is not room for an ordinary day's practice if a registration of the operations to be performed is attempted.

Besides the calendar and engagement pages, the compilers have added much useful information for the dentist. A lexicon of twenty-two pages of foreign words and expressions useful to the dentist is added—a new and excellent feature. Palatine defects are treated, after Coles and Kingsley, in nine pages. The rest of the calendar is devoted to the following subjects:—The application and duration of the artificial velum; the influence of the different acids on tooth-structure, after Magitot; the symptoms of odontalgia and treatment; the composition and application of tooth powders and tinctures; members of the societies of German mechanical dentists, as well as their colleagues in Germany, Austria, and Switzerland.

This certainly comprises a useful and varied fund of information, always convenient of access. If American publishers of these very useful annuals would adopt some of the foreign ideas, they would

be of far more value than at present. While the general make-up, for instance, may be unexceptionable, the paper is objectionable. The Germans always use a soft paper peculiarly adapted to the lead-pencil, rendering it a pleasure to record memoranda upon it. Those who have the getting-up of dental diaries should bear this in mind.—J. T.

THE DISEASES OF THE LIVER, with and without Jaundice, with the Special Application of Physiological Chemistry to their Diagnosis and Treatment. By GEORGE HARLEY, M.D., F.R.S. Illustrated by Colored Plates and Wood Engravings. Philadelphia: P. Blakiston, Son & Co., 1883. Price, cloth, $5.00; leather, $6.00.

The author of this treatise has been known for many years as a specialist in diseases of the liver. In 1863 he published a monograph on this subject, of which the volume before us is an amplification, the result of twenty years' additional observation, reflection, and practice. It is an orderly, comprehensive—we might say exhaustive—presentation of hepatic derangements, treating of every variety, from mere "biliousness" to the gravest and most formidable lesions.

The book contains a larger amount of clinical and scientific data on the subject treated than has, perhaps, ever before been collected into one volume. The concluding chapter, entitled "Hints on Differential Diagnosis," is, of itself, well worth the price of the book.

QUESTIONS ON HUMAN ANATOMY. By SAMUEL O. L. POTTER, M.A., M.D. With Sixty-three Illustrations. Philadelphia: Presley Blakiston, Son & Co., 1882. Price, $1.00.

This the first of a series of eight Quiz Compends in preparation, for which it is claimed that they are based on the most popular text-books; that they are concise, thorough, and systematically arranged; that they are the production of authors who have had large experience as quiz-masters; that they can be used by students of any college; that the information in such a condensed practical shape has nowhere else been collected; that their size admits of their being easily carried in the pocket, and that they are sold at a very low figure.

Of its class, this book seems to be all that could be expected.

A HAND-BOOK OF MATERIA MEDICA AND THERAPEUTICS, for Dentists and Dental Students. By D. R. STUBBLEFIELD, A.M., M.D., D.D.S. Published by the Author, Nashville, Tenn., 1882.

This book is in the main a collection of the leading facts with reference to drugs which are more fully elaborated in the United States Dispensatory, and in treatises on materia medica and thera-

peutics. We can hardly conceive that the book would have any value to any but a student when preparing for examination.

OBITUARY.

DR. WILLIAM H. ALLEN.

At a special meeting of the Board of Trustees of the New York College of Dentistry, held November 8, 1882, resolutions were adopted in reference to the death of Dr. William H. Allen, (a notice of which was given in our last number), who had been president of the board for the past seven years. The resolutions expressed sorrow at the death of Dr. Allen, and appreciation of him as a co-worker, who had been an earnest promoter of the interests of the college since its organization, a wise counselor, a tried friend, and a true gentleman; avowed the belief that the dental profession had lost one of its brightest ornaments, and the community a man of integrity and fidelity; tendered sympathy to the widow in her bereavement, and ordered that the proceedings be spread upon the minutes of the board.

DR. CHARLES B. FOSTER.

At the fourteenth semi-annual meeting of the Fifth District Dental Society of New York, held at Oswego, October 11, 1882, resolutions were passed commemorative of the death of Dr. Charles B. Foster, of Utica, an ex-president of the society, a notice of whose death appeared in our October number. The resolutions regretted the removal by death of one of the oldest and most prominent members of the society; expressed admiration of his character as a true friend, a gentleman whose uniform courtesy and kindness made his memory endeared, and who always manifested a deep interest in all that contributed to the advancement of his profession. Sympathy was extended to his bereaved family, and the resolutions were ordered to be entered on the minutes of the society.

DR. GEORGE A. HORTING.

Dr. George A. Horting died in Lancaster, Pa., from inflammation of the lungs, on November 1, 1882. Dr. Horting was forty-five years of age; had been in the practice of dentistry twenty years, and was esteemed in the community as a conscientious practitioner and upright citizen.

PUBLISHER'S NOTICE.

THE DENTAL COSMOS FOR 1883.

WITH this number we complete our engagement with subscribers to the Twenty-fourth Volume of the DENTAL COSMOS.

The initial number of the Twenty-fifth Volume will appear on January 1, 1883, and succeeding numbers on the first of each month following.

Twenty-four years of uninterrupted monthly publication and a steady increase in circulation and influence justify the belief that the efforts of publisher and editor have met the approval of our patrons. We have aimed to stimulate study, to quicken the spirit of research, and to supply the wants of every ambitious practitioner; have sought to furnish information of all improved modes of practice which the best heads and hands in the profession have developed; have endeavored to gather all that general medicine, surgery, and their associate sciences have afforded of special significance in the theory or practice of dentistry. We have certainly adhered persistently to the original aim as expressed in the title of the journal—to make it first and always a *dental* periodical. No contribution has been accepted, no selection made, which did not promise to be of value to the dentist as such; and, as to the future, it is our intention to adhere to this idea.

The DENTAL COSMOS will continue to be a DENTAL journal—*the* dental journal of the world, if our experience, efforts, and means will enable us to make it so. We are assured that each of the twenty-four volumes has been worth more than the subscription price, and certainly every consideration will stimulate effort not only to maintain but to advance its standard of excellence.

Nearly all the subscriptions terminate with this issue, and *those desiring to renew will find a prepared blank for the purpose preceding the advertising pages of this number.* We rely on the use of this blank, and shall not send bills as heretofore. The January number will be sent to all subscribers to the current volume, but no subsequent number, except to those authorizing its continuance. Prompt renewals and subscriptions are earnestly desired and solicited.

THE S. S. WHITE DENTAL MANUFACTURING CO.

HINTS AND QUERIES.

"He that questioneth much shall learn much."—Bacon.

Correspondents desiring a reply in this department are requested to make use of *distinctive signatures or initials*, and avoid the practice of signing their communications Reader, Subscriber, etc.

Correspondents who wish notice to be taken of their communications should authenticate them with their names. We cannot insert queries or replies except they are so accompanied. Names not necessarily for publication.

Will some one please state in "Hints and Queries," the best way to mount corundum disks, so that they will be perfectly true?—W. W. J.

I have been much annoyed of late by the fracture of sectional blocks occurring after vulcanization. I am using the same make of teeth which I have been accustomed to for several years. My neighbors who are using the same teeth do not complain, but I seem to have got into a bad rut. Can any one help me out?—T. L.

Dr. Webb, in his paper on "Difficult and Extensive Operations," in the August number of the Dental Cosmos, concludes by saying that when crowns have been attached to one or more adjoining teeth, "if it should afterwards become necessary to perform operations upon the adjoining teeth, the rubber dam can as readily be applied as before attaching the crown." I have tried this, and have as yet failed, and would be heartily glad to learn how to apply the rubber dam in such cases.—I. N. Broomell.

About ten days ago a young man, aged 22, came to my office for the purpose of obtaining relief for pain he had been suffering, caused, as he thought, by the nerve of the right superior central. The tooth in question I found to be extremely sensitive to the touch, so much so that he had not been able to eat with any degree of satisfaction for the past twenty-four hours. The tooth contained a small antero-approximal gold filling in good condition, and undoubtedly, in my belief, the pulp at that time was normal in every respect. I examined the mouth carefully, and found that the left inferior wisdom-tooth was partly erupted, the gum surrounding it inflamed, but not sore to the touch. I diagnosed this to be the cause of his trouble, and, as a remedy, lanced the parts freely, painted the gum over the central incisor as a further preventative, with tinct. iodine, and discharged the patient for the time. Have seen him at intervals since then; the pain had immediately subsided and there has been no recurrence. The question in my mind is: Did the central incisor receive some mechanical injury, which the patient stoutly denies, or was the soreness in the *superior central* due to the *inferior wisdom-tooth* on the opposite side of the mouth?—F. S. M.

A. C. F. will have to give a better description of the condition of the tooth before the operation, as much would depend upon whether the pulp had been destroyed or not, and if it had, how long it was allowed to remain in the tooth, and the amount of congestion while dying.—W. E. B.

Another Danger with Anesthetics.—Some time ago a lady, accompanied by her husband, came into my office to have a number of teeth extracted. As she desired to take gas, I carefully examined the teeth and roots to be removed, and administered the anesthetic. After removing eight or ten teeth without the slightest pain, or even movement, on her part, I patiently waited for her to regain consciousness; when, just as I held her head over the spittoon, judge of my surprise to see a number of pins hanging down to the clotted blood and saliva. I asked her where they came from. She laughed, and said, "Oh, I had them under my tongue and at the sides of my cheeks." Her husband cried out in language more forcible than elegant, "I told her those pins would be the death of her yet." She actually sleeps all night with them in her mouth.—D. V. Beacock.